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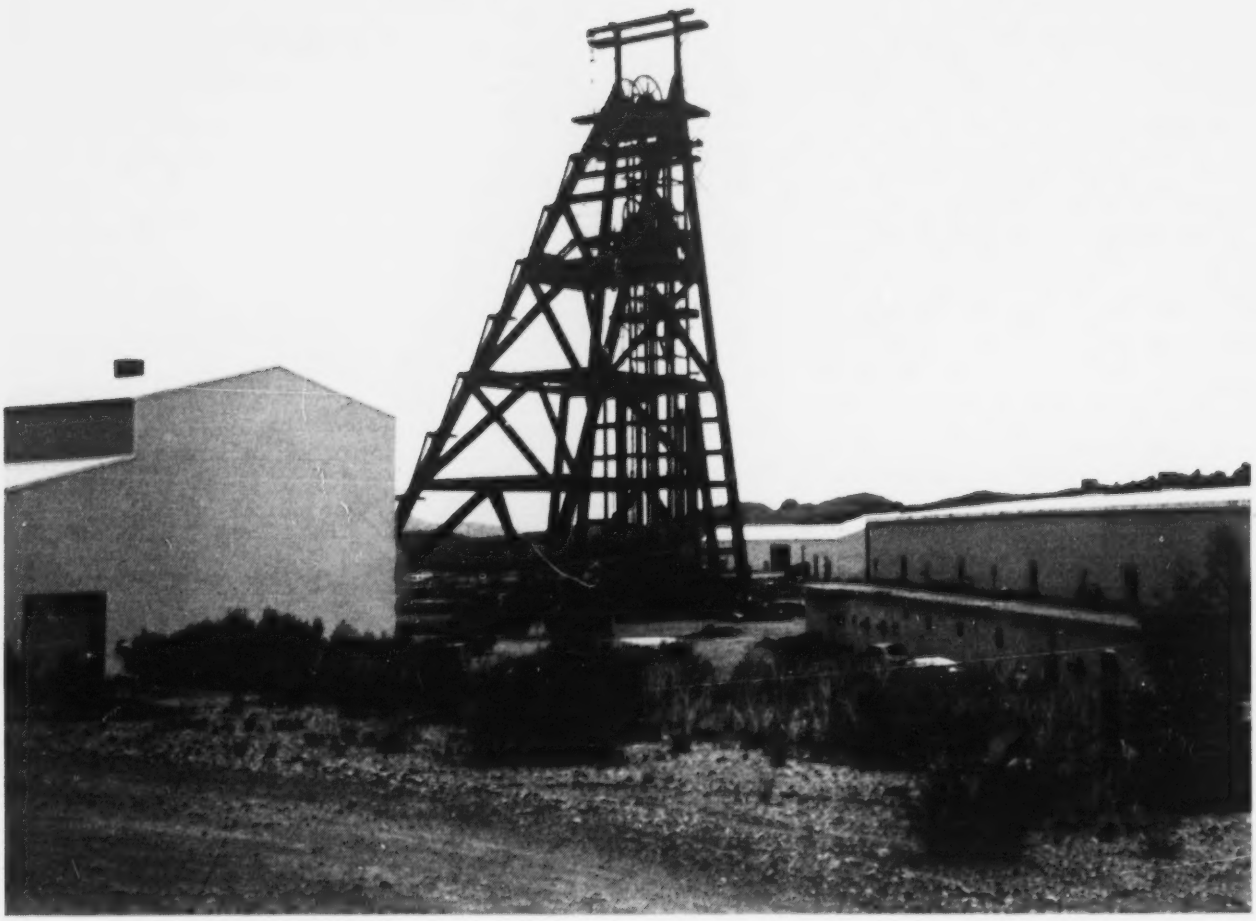
THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1990



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BY RICHARD R. BEARD

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DEPARTMENT OF MINES AND MINERAL RESOURCES

Leroy E. Kissinger, Director

THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1990

Special Report No. 17

by

Richard R. Beard, Mining Engineer

April, 1992

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* Throughout this report a "ton" means a short ton (2,000 pounds or 0.90718 metric ton).

Specific statistics may vary slightly from table to table due to differences in source data.

INTRODUCTION

The Arizona Department of Mines and Mineral Resources presents herein a report covering activity in Arizona's copper industry in the calendar year 1990. A brief review of operational highlights reported by the major developers and producers in the State, market and price developments that affected copper production, and discussions of Arizona severance taxes on metalliferous minerals are included.

The contained statistical tables include various production, employment, inventory, import/export, prices, costs, and ore reserve numbers for 1990. Production of recoverable copper is given for individual mines and by company. Figures showing the importance of copper in the mining industry are provided, as are data on the by-products of copper mining; gold, silver, and molybdenum. In addition, historical compilations are included for leach copper, average grade of ore produced, percent copper recovered, open pit mine stripping ratios, and employment and earnings. Additional compilations indicating refined copper inventories in and out of the United States and average copper prices by month from 1981 through 1990 are provided. Also included are tables showing designed mine capacity and copper reserves in Arizona plus average copper cash production costs for the United States, 1983-1988.

The Department maintains extensive reference libraries in its Phoenix and Tucson offices concerning the copper industry in Arizona. These repositories include information on individual mines and mining companies, United States Bureau of Mines and United States Geological Survey publications, other professional publications, periodicals, and earlier editions of this report. Additionally, experienced mining engineers are available for consultation, at no charge, on matters germane to the minerals industry. Office hours are 8 a.m. to 5 p.m. on all non-holiday weekdays in Phoenix and on Mondays and Tuesdays in Tucson.

ACKNOWLEDGEMENT

The author wishes to express his sincere appreciation to the management and staff of each of Arizona's mining companies for graciously devoting time and effort to provide information for this report. Michael Greeley of the U.S. Bureau of Mines, Dr. George Leaming of the Western Economic Analysis Center of Marana, Arizona, and the American Bureau of Metal Statistics, Inc. of Secaucus, New Jersey also provided vital information.

Thanks are also due to the Arizona Department of Economic Security, the Arizona Department of Revenue, and the staff of the Joint Legislative Budget Committee for providing statistics and data.

A special gratitude is felt toward the preceding authors for providing the format and sources of statistical information and to Leroy E. Kissinger, Director of the Department of Mines and Mineral Resources, for providing the opportunity to author this report.

COPPER PRODUCTION IN ARIZONA - 1990

Arizona's copper industry produced 1,087,287 tons of copper in 1990 (Table I). This is an increase of 8.2% above 1989, but is still 1.4% below the record production of 1981 (Table IX). Arizona's share of the United States total was up to 62.5% from 60.8%.

The gross value of non-fuel mineral production in Arizona in 1989 was down 3% from 1989 to $3,060,218,000 (Table X) as copper prices declined. Copper production represents 86% of this total; the by-products of copper production (gold, silver and molybdenum) represent an additional 3.9% (Table IX). The total contribution of the copper mines was therefore 89.9% of the gross value.

Copper was produced by 5 companies from 15 properties in 1990 and molybdenum was recovered as a co-product or by-product at 5 of these properties (Tables III & IV). Eight properties produced 98.8% of Arizona's copper and 3 produced 94.3% of the molybdenum. The Morenci-Metcalf mine of Phelps Dodge led in copper production with 30.9% of the total. The Sierrita-Esperanza complex produced 53.5% of the molybdenum.

More than 300,000 tons of copper representing 27.7% of the total was produced by leaching in 1990.

Solvent extraction-electrowinning produced almost 293,000 tons of cathode copper from these leach solutions. The remaining 7,800 tons were precipitated as cement copper (Table I).

Stripping of waste, including some leachable material, was accomplished at the 9 operating open pit mines during 1990. The weighted average of the stripping ratios - waste to ore - was 1.57 to 1 (Table VIII). This is comparable to the 1.46 to 1 in 1989 which probably indicates continued normal long range mine planning.

The weighted average grade - percent copper - of sulfide ores mined in 1990 was 0.58% copper (Table VI).

The estimated capacity to produce copper at each of Arizona's principal operations totals 1.173 million tons annually (Table XI). By this estimate the mines, concentrators, and leach facilities operated at 92.7% of capacity in 1990.

The copper reserve base in Arizona by company and property is estimated in Table XIII. The reserve base as defined in "Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3, includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently sub-economic (sub-economic reserves). The many technical, political, social, and economic variables render a listing of actual economic reserves inappropriate.

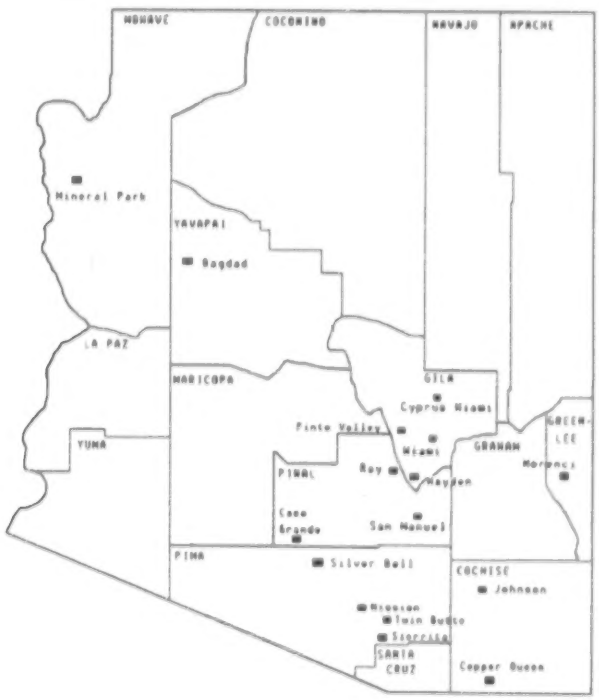


Figure 1. Producing Copper Properties - 1990

1990 OPERATIONS SUMMARY

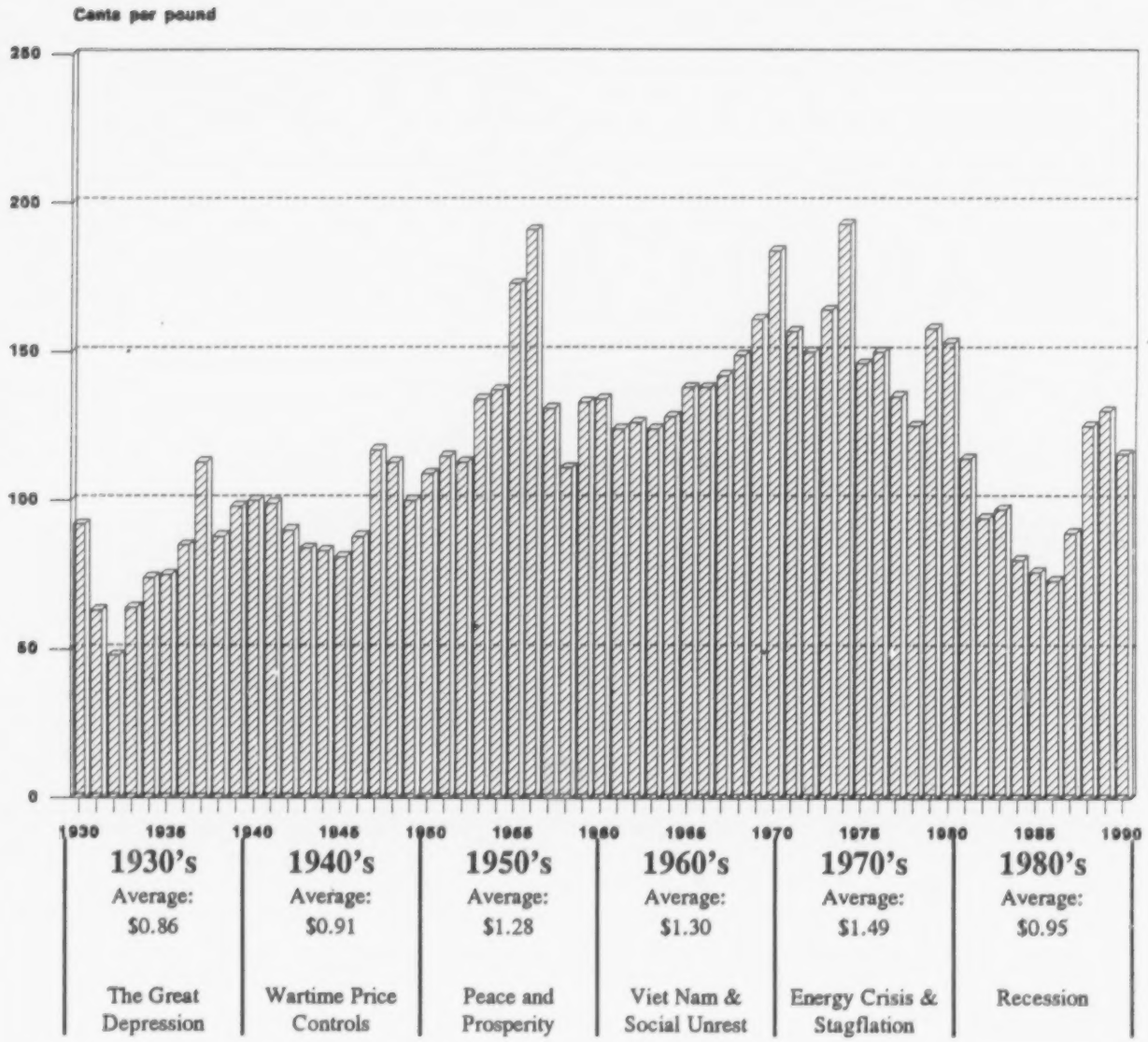
Operating Properties	15
Operating Companies	5
Operating Smelters	3
Ore Mined (including some oxide)	213,168,000 tons
Ore Milled (sulfides)	168,460,000 tons
Waste/Overburden removed (includes some leach material)	296,177,000 tons
Average stripping ratio	1.57:1
Copper produced	1,087,287 tons - 62.5% of U.S.
From sulfide ores	786,607 tons - 72.3% of AZ
Average grade	0.58% copper
From leaching	300,678 tons - 27.7% of AZ
SX-EW	292,875 tons - 97.4% of leached 26.9% of total
Precipitation	7,803 tons - 2.6% of leached
Molybdenum produced	29,344,000 pounds
Silver produced	4,069,000 troy ounces
Gold produced	44,000 troy ounces
Average employment	11,352
Average annual wage	$36,243
Productivity (production workers)	121 lb. of copper per man-hour, 11.9 tons of ore per man-hour

SOME COMPARISONS OF COPPER MINE PRODUCTION - 1990

	Production (tons x 1000)	% of Arizona Production	% of U.S. Production	% of World Production
Arizona [1]	1,087.3	100.0	62.5	10.8
U.S. [2]	1,739.0	-	100.0	17.2
World [3]	10,111.7	-		100.0
Counties				
Greenlee	335.7	30.9	19.3	3.3
Pinal	258.8	23.8	14.9	2.5
Pima	222.6	20.5	12.8	2.2
Gila	157.7	14.5	9.0	1.6
Yavapai	107.5	9.9	6.2	1.1
Others	5.0	0.4	0.3	0.1

1 ADMMR - this report
2 USBM - *Mineral Industry Surveys - Copper*, Dec. 1990
3 ABMS - *Nonferrous Metal Data*, 1990

Figure 2. COPPER PRICE IN CONSTANT 1989 DOLLARS



Source:
U.S. Gross National Product Deflator Price Index - U.S. Bureau of Economic Analysis
U.S. Producer Price Index of Intermediate Materials for Durable Manufacturing - U.S. Bureau of Labor Statistics
U.S. Consumer Price Index (CPI) - U.S. Bureau of Labor Statistics
Historic Prices - Metals Week: Copper, Wire Bars

As reported in *Non-Ferrous Metal Data, 1983* and *1989*, American Bureau of Metal Statistics

STATUS AND PROGRESS

Although prices softened somewhat during the year, the increased efficiencies at Arizona's copper properties made 1990 another profitable year for the industry. The continued political and labor problems that plagued some of the foreign producers staved off the predicted glut of copper on the world market. Although world stocks of refined copper rose by 20% the U.S. stocks actually declined 22%. The outlook for the early nineties is for a deficiency of smelter capacity in spite of the increased SX-EW production.

The major companies continued to expand production at current properties as opposed to opening new properties, although Magma did reopen its namesake Magma Mine at Superior.

The smaller companies were less conservative. Arimetco shut down and sold emerald Isle, but started production at Johnson camp and is conducting feasibility studies at the Van Dyke for an in-situ/SX-EW operation. Holcorp Gold plans to operate Emerald Isle with an SX-EW plant to be built by Arimetco as a part of the purchase deal. The Oracle Ridge property neared production and AZCO continued with studies and permitting at the Sanchez property.

OPEN PIT MINING

Open pit mining is the principal method of producing copper. Loading equipment ranges from front-end loaders to electric shovels and haulage is by off road trucks, sometimes in conjunction with conveyor belts.

In 1990, ten open pits were mined. Six produced principally sulfide and oxide ore, and two produced principally oxide ore.

UNDERGROUND MINING

San Manuel is the largest underground metal mine in the nation and utilizes the block caving method of mining. This method consists of undercutting a block of ore and allowing the ore to cave into draw points to be loaded onto trains for haulage to the shaft and hoisted to the surface.

Towards the end of the year, the original Magma Mine at Superior became the only other underground copper mine operated in 1990. Superior utilizes the undercut and fill method of ore extraction.

IN-SITU MINING

In-situ leaching of rubbleized copper bearing material remaining in mined out underground stopes has long been practiced in Arizona. At San Manuel, Magma is developing a more formalized program of leaching mined out block caving stopes and is approaching production status. During the last few years all of the production from the Lakeshore property has been from a similar system developed by Noranda. Cyprus is continuing this project as well as tests of in-situ leaching of non-rubbleized or virgin ground.

The U.S. Bureau of Mines is partially funding tests of in-situ leaching of virgin ground in Arizona. Asarco is cooperating with the Bureau at the Santa Cruz property near Casa Grande. The Santa Cruz ore body is a deep seated acid soluble deposit which is owned by Asarco and Freeport McMoran on a 50-50 basis.

SOLVENT EXTRACTION

Traditionally the copper produced from leach solutions has been extracted by cementation process (precipitation from solution by the replacement of copper in solution by metallic iron). This has been a source of relatively cheap copper, but the cement copper produced must be smelted and refined along with the flotation concentrates.

During the 1960's, Ranchers Exploration and Development Corporation pioneered the use of solvent extraction-electrowinning to produce copper from its Bluebird property near Miami. The obvious advantage of this method is that cathode copper of salable quality can be produced directly from leach solutions. Smelting, with its pollution problems, and further refining are therefore not required.

During the relatively good years experienced by the industry after Rancher's introduction of solvent extraction-electrowinning, interest in the process grew gradually. The disastrous 80's prompted an accelerated interest in it, however. Twelve plants operated during 1990. Several expansions or new plants are planned and the cementation process is being phased out except as a subsidiary method.

CONCENTRATION

The overwhelming majority of copper mineralization in Arizona is of the sulfide type and is not amenable to leaching without extraordinary means. Inspiration has had success with its heap leach-ferric cure process on mixed oxide-sulfide ores and Kennecott pioneered the use of bacteria to convert sulfides to oxides in low grade dumps. However, as shown in Table I, about 75% of the copper was produced by the flotation method of concentration. In addition much of the leached copper produced is from dumps of "waste" that was stripped from open pit mines to provide access to sulfide ore. Another aspect of the flotation process that makes it

viable at some properties is the recovery of molybdenum by selective flotation. Molybdenum provides a significant portion of the revenues from some properties. Also, any precious metals in the ore follow the copper through the flotation process and smelting to the electrolytic refinery where they can be recovered from the anode slimes.

There are currently nine flotation concentrators in operation in Arizona. Asarco is operating 3 - 1 at Ray and 2 at Mission, Cyprus is operating 2 - Bagdad and Sierrita, Magma is operating 3 - San Manuel, Pinto Valley, and Superior, and Phelps Dodge 2 at Morenci-Metcalf.

Although efficiency is constantly being improved, the flotation process is not cheap. It requires crushing and grinding the ore, separation of the ore minerals from the gangue minerals in the flotation cells, smelting the concentrate, and refining the copper anodes from the smelter. The most significant development in flotation is the column flotation cell being installed in most concentrators.

SMELTING

Of the six smelters remaining in Arizona in 1989 only three operated. Asarco's Hayden smelter and Cyprus' smelter at Miami have been brought into compliance with air pollution constraints and Magma's smelter at San Manuel has been retrofitted with an OutoKumpu flash furnace to bring it into compliance. The Ray smelter at Hayden that Asarco acquired from Kennecott met all significant environmental constraints when last operated in 1982. Phelps Dodge's smelters at Ajo and Morenci will require extensive retrofitting before they can be operated. Phelps Dodge is shipping concentrates to its Hidalgo smelter at Playas, New Mexico and to the Chino smelter at Hurley, New Mexico that was recently acquired from Kennecott. Excess concentrates are being sold.

As an alternative to smelting, Cyprus Casa Grande has reactivated the Roast-Leach-Electrowinning (RLE) plant built by Hecla at the Lakeshore property. In this process flotation concentrates are roasted to make them acid soluble and leached with sulfuric acid. Salable cathode copper is extracted from the leach solution by electrowinning. Cyprus is upgrading the leach solutions in the solvent extraction plant before electrowinning. Acid is produced from the roaster gases and the process is essentially pollution free.

A portion of the concentrates from Sierrita are being processed at this plant.

PROGNOSTICATION

After looking at all of the trends, figures and statistics and reading the statements of the experts, I believe that I'll defer to Richard De J. Osborne in his comments at the Institute of Metal's Copper 90 conference held in Sweden. It seems to summarize the view of the people in the industry.

"Unlike the popular view, I see the copper industry as a growing business, supported by efficient, well-run producers and fabricators -- and an industry which is investing in the market development necessary to assure its own future. I do not subscribe to the view of the social planners that our industry is a sunset industry which should be set aside in their grand plan for the world's future."

ARIMETCO INCORPORATED

Corporate Headquarters - 6245 E. Broadway, Suite 350, Tucson, Arizona 85711
Phone (602) 745-8882

Arimetco acquired the Emerald Isle and Johnson properties in Arizona and the Yerington property in Nevada during 1989.

At Johnson camp cathode production from previously mined ore heaps was started in 1990 upon the completion of the SX-EW plant.

The Emerald Isle operation was sold to Holcorp Gold Mines contingent upon Arimetco building an SX-EW plant at that property.

The Van Dyke property at Miami was purchased and feasibility studies for a modified in-situ leaching/SX-EW operation are being conducted.

Emerald Isle

Kingman, AZ
Phone (602) 565-4554

The Emerald Isle which consisted of in-situ leaching and a precipitation plant was shut down in the first quarter of 1990. It was subsequently sold to Holcorp gold Mines contingent on Arimetco building an 8,000 PPD SX-EW plant to replace the precipitation plant.

Johnson

Benson, AZ
Phone (602) 586-2241

Construction of a 35,000 PPD SX-EW plant was completed and put in production in October, 1990. Initial production is from leaching existing heaps and mining of new ore will commence in 1991 with a fleet of 4 120 ton trucks.

ASARCO INCORPORATED

Corporate Headquarters - 180 Maiden Lane, New York, New York 10038 - Phone (212) 669-1000

In Arizona, Asarco operates copper mines at Sahuarita, Ray and Silver Bell and a copper smelter at Hayden. In Texas, they operate a copper smelter at El Paso and a copper refinery at Amarillo. They also hold major interests in MIM Holdings Limited, Mexico Desarrollo Industrial Minero, S.A. (MEDIMSA) and Southern Peru Copper Corp. (SPCC).

In June 1989 Asarco purchased 49.9% of a partnership formed by Montana Resources to own and operate the Continental Mine in Butte, Montana.

In addition to copper, Asarco mines and refines lead, zinc, gold and silver and produces coal, industrial minerals and chemical and manufactured products.

Tucson Office - 1150 N. 7th Ave., P.O. Box 5747, Tucson, Arizona 85703 - Phone (602) 792-3010

The Tucson office houses the Southwest Mining Department, the Mining Department/Corporate Office, the Mineral Beneficiation Department, the Exploration Department, the Acid Sales Department, Safety Department, and Government of Affairs Office.

During 1990 Asarco's Arizona operation consisted of a major copper smelter at the Hayden Unit, major open pit mines at the Mission and Ray Units, and a dump leaching/cementation operation at the Silver Bell Unit. With the increased production at the Mission Complex, Asarco is able to produce 67% of the feed to its smelters.

Asarco continued its $375 million program to become self-sufficient in concentrates to feed its smelters. The program includes a 42% increase in production at the Mission complex by utilizing the idle Cyprus Pima mill and a 58% increase in production at Ray by building a new mill at the mine site to supplement the production from the Ray mill at Hayden. Also included in the expansion is the resumption of mining and the construction of an SX-EW plant at Silver Bell.

The in-situ study at the Santa Cruz property in cooperation with the U.S. Bureau of Mines continued. Injection of saline solution to determine the hydrology of the deposit was accomplished and the results are being evaluated.

Asarco also holds major reserves at the Chilito north of Hayden, at Helvietia, east of the Mission Complex and at Sacaton East.

Hayden Unit

Box 98, Hayden, Arizona 85235 - Phone (602) 356-7804

The Hayden Unit consists of an INCO flash furnace smelter rated at 720,000 tons of charge per year for an estimated production of 175,000 tons of blister copper. An acid plant rated at 1,600 tons of sulfuric acid per day keeps sulfur dioxide emissions within air quality restraints.

By 1992, when Asarco's expanded and modernized copper facilities are operating at capacity their output will be enough to provide all the feed to its smelter.

Mission Unit

Box 111, Sahuarita, Arizona 85629 - Phone (602) 791-2920

The Mission Unit consists of the consolidation of the Mission, Eisenhower, San Xavier, and Pima open pit mines into one large open pit referred to as the Mission Complex. Also included is the smaller San Xavier North pit. The acquisition of the rest of the Eisenhower in April and of the Mineral Hill deposit adjacent to the Pima section of the open pit late in 1987 increased reserves and facilitates further efficiencies in pit design and mine planning.

Mining is conducted by electric shovels with truck haulage to the primary crusher and waste dumps. Some areas of the pit are back to final limits allowing some waste dumping in pit. The stripping ratio in 1990 was 2:87:1, waste to ore.

The addition of the refurbished Pima mill increased concentrator capacity to a total of 59,000 TPD.

Ray Unit

P.O. Box 9, Hayden, Arizona 85235 - Phone (602) 356-7811

The Ray Unit consists of an open pit mine, dump leach and heap leach operations, and a 40,000 ton per year SX-EW plant at Ray and a 26,000 ton per day concentrator at Hayden.

Mining is conducted by electric shovels supplemented by front-end loaders utilizing truck haulage. The production rate is 100,000 tons per day of which 26,000 tons are sulfide ore sent to the mill, and 10,000 tons are silicate ore that is crushed and sent to the leach heaps. The remainder is low grade sent to leach dumps or waste sent to waste dumps. The stripping ratio in 1990 was 1.90:1, waste to ore. The mine plans are predicated on the sulfide operation and therefore silicate ore is stockpiled when in excess and fed from the stockpile to the crushers when short.

Sulfide ore is hauled by truck to the primary crusher at Ray where it is crushed and transferred to trains for the 20 mile haul to the mill.

Silicate ore is hauled to the primary crusher then further reduced to minus 3/4 inch by secondary and tertiary crushers. It is then transported by conveyor where it is agglomerated with sulfuric acid while in transit to the heap leach area. Final haulage and placement on the heaps is by end-dump trucks.

Low grade muck is hauled to prepared leaching areas and non-mineral muck is hauled to waste dumps by end dump trucks. All leach solution are now fed to the SX-EW plant.

Previously stockpiled native copper ore is being reclaimed and fed to the mill in small proportions as is smelter slag.

A $12 million project was started in 1988 to maintain production capacity as the hardness of the ore increases as the pit deepens. In addition, $130 million of the $260 million expansion project will be spent at the Ray Unit. A 60,000 ton per day portable in-pit crusher and conveying system will replace the 30,000 ton per day primary crusher at the pit and a 20,000 ton per day concentrator will be built at the mine site. Concentrates will be hauled by rail to the smelter at Hayden. The project is scheduled for completion in 1992.

Silver Bell Unit

Marana, Arizona 85653 - Phone (602) 622-6551

The Silver Bell Unit consists of an open pit copper mine on stand by status. The dump leaching operation and precipitation plant are in operation. Reactivation of the mine and construction of an SX-EW plant is planned.

CYPRUS MINERALS COMPANY

Corporate Headquarters - 9100 E. Mineral Circle, P.O. Box 3299, Englewood, Colorado 80112 - Phone (303) 643-5000

Cyprus has continued to grow. In March 1988 it entered into a 15 year lease of the Twin Buttes property formerly operated by Anamax and in July 1988 they acquired the entire Inspiration property at Miami including the mines, concentrator (inactive), SX-EW plant, smelter, acid plant, electrolytic refinery, and rod plant. Cyprus was Arizona's second largest producer of copper in 1990 and continued to be the largest producer of molybdenum.

In 1990 Cyprus accomplished a 20% increase in capacity at its Bagdad mill by adding a fifth grinding line.

Production continued at the Sierrita and the leased Twin Buttes properties. Sulfide ore from Twin Buttes is conveyed by belt to the Sierrita Mill and the oxide ore is treated in the agitation leach/SX-EW plant built by Amamax at Twin Buttes.

At Cyprus Miami a project to make Cyprus indiependent of outside smelting was announced. An increase in capacity from 450,000 tons to 650,000 tons of concentrate per year is scheduled for completion in 1992 at the Miami Smelter.

The refurbished Hecla lakeshore RLE (roast-leach-electrowin) plant at Cyprus Casa Grande is treating con-

centrates from other Cyprus properties. The pregnant solution is fed to the solvent extraction plant with the in-situ solution prior to electrowinning.

In addition to its copper-molybdenum properties, Cyprus operates Arizona's largest gold mine, the Copperstone north of Quartzsite.

Cyprus has grown on a worldwide basis as well as in Arizona. It operates the Thompson Creek molybdenum mine in Idaho and in July, 1988 it acquired the molybdenum mine at Tonopah, Nevada.

In March 1989, Cyprus acquired the Warrenton Refining Co. in Truesdale, Missouri, a producer of copper ingot and wire bar from scrap. In February of 1990 they acquired MCR Products Inc. in Chicago, Illinois from Magma, a producer of high quality copper rod.

In Australia Cyprus owns a share of and operates the Gidgee, Selwyn and Moline gold mines and has a share of the Sheahan-Grants gold mine. In New Zealand it is developing the Golden Cross Project.

In 1990 Cyprus produced coal from 8 mines in Colorado, Kentucky, Pennsylvania, Utah, West Virginia and Wyoming; talc in Montana, Vermont, Alabama, and Spain; and barite in Georgia. With the acquisition of Foote Mineral Company in April of 1988 it became the major producer of lithium from salt brines in the Silver Peak facility in Nevada and in northern Chile.

Cyprus acquired the Reserve Iron Operation in northern Michigan in 1989. These facilities were rehabilitated and commenced production in 1990.

Cyprus Bagdad

P.O. Box 245, Bagdad, Arizona 86321 - Phone (602) 633-2241

The Bagdad operation consists of an open pit copper-molybdenum mine, a 71,000 ton per day concentrator, a dump leach operation and an SX-EW plant.

Mining is conducted by electric shovels using truck haulage to the primary crusher and dumps. The stripping ratio in 1990 was 1.17 to 1, waste to ore.

The sulfide ore is transported from the primary crusher at the mine, a distance of 6,400 feet to the coarse ore stockpile at the concentrator, by conveyor belts. There it is crushed further, ground by autogenous and ball mills and copper and molybdenum concentrates are produced. Column cells are utilized in the molybdenum flotation circuit.

Dual process ore (sulfide ore with an unusually high oxide content) is placed in heaps and leached for 60 days before being sent to the concentrator.

Pregnant solutions from the leach dumps are collected behind dams and pumped to the SX-EW plant at approximately 1.8 grams of copper per liter. The barren solutions are returned to the dumps after the copper has been extracted.

Cyprus Casa Grande

P.O. Box C-9, Casa Grande, Arizona 85222 - Phone (602) 623-1539

The Casa Grande operation consists of an in-situ leaching operation and an SX-EW plant. The block caved stopes in the oxide orebody are being leached and development of a leaching operation in virgin ground is underway using high pressure pumps to inject sulfuric acid solution into holes drilled from the old underground workings. Pregnant solutions are collected in sumps underground and pumped to the SX-EW plant.

The roasters and acid plant of the Roast-Leach-Electrowinning (RLE) plant built by Hecla have been refurbished and are treating concentrates from Sierrita. The pregnant solutions go to the SX-EW plant and the acid produced from the roaster gases is used for the leaching operations.

Cyprus Miami

P.O. Box 1559, Claypool, Arizona 85532 - Phone (602) 473-7150

The Cyprus Miami properties consist of three open pit copper mines formerly called Inspiration Mines, a 24,000 ton per day concentrator that is currently on standby status, a 450,000 ton per year electric furnace smelter, acid plant, SX-EW plant, electrolytic refinery and a 135,000 ton per year rod plant.

The ore is mined at the rate of 50,000 tons per day with electric shovels and hauled by truck to high grade, low grade and waste dumps. The stripping ratio in 1990 was 0.55:1 waste to ore. Soon after Cyprus acquired the property the construction of the second, nearly identical, solvent extraction train was completed that increased the capacity of the plant to 8,000 gallons per minute. The 25 cycle AC to DC motor-generators were replaced with modern rectifiers to increase the capacity and efficiency of the tank house. The cathodes from both the electrowinning and electrorefining sections are fed to the continuous cast rod plant to produce 5/16 inch copper rod on reels holding three and one-third miles of rod each.

Cyprus Mineral Park

P.O. Box 6249, Kingman, Arizona 86401 - Phone (602) 565-2226

The Mineral Park property consists of an open pit copper-molybdenum mine and a 15,000 ton per day concentrator that are both on stand-by status. The dump leaching operation and the precipitation plant are in operation and some in-pit leaching is also being conducted.

Cyprus Sierrita/Twin Buttes

P.O. Box 527, Green Valley, Arizona 85622 - Phone (602) 791-2950 & (602) 625-4800

The Cyprus Sierrita property consists of an open pit copper-molybdenum mine, a 100,000 ton per day concentrator, a ferromolybdenum plant, a rhenium plant, a dump leaching operation, and an SX-EW plant.

Mining is conducted using electric shovels and truck haulage to the crushers and dumps. The stripping ratio in 1990 was 0.79:1, waste to ore.

Production was started at the Twin Buttes mine in 1988 providing additional feed to the Sierrita Mill. The stripping ratio in 1990 was 4:38:1. Construction of a 6.8 mile conveyor to transport sulfide ore to the Sierita concentrator was completed in 1989. Twin Buttes contributed about one third of the copper produced at the Sierrita concentrator in 1990. The SX-EW plant at Twin Buttes is fed with solutions from leaching tailings.

MAGMA COPPER COMPANY

Corporate Headquarters - P.O. Box M, San Manuel, Arizona 85631 - Phone (602)385-3100

In March 1987, after nearly 20 years as a wholly owned subsidiary of Newmont Mining Corporation, Magma once again became an independent corporation. As such it has continued implementing an extensive expansion and modernization program to meet all environmental constraints and to become competitive in the copper market. As part of this program the company housing in the town of San Manuel is being sold.

Magma's Arizona operations are divided into the San Manuel Division and the Pinto Valley Division which include the Pinto Valley Unit and the Miami Units, and the the original Magma Mine at Superior.

At San Manuel the development of the Kalamazoo ore body continued with some production in late 1990. The recovery of solutions from the in-situ leaching was increased by changes in well to well leaching technology.

The smelter at San Manuel attained full design capacity production.

At Pinto Valley 14 haulage trucks were replaced with larger units to provide additional feed to the concentrator. Mill capacity was expanded in 1989.

Operational difficulties are being experienced by the No. 2 Tailings leaching project.

Production at the Superior underground mine was started with an expected production rate of 1500 tons of ore per day by the end of 1991.

The McCabe gold mine started production with concentrates being shipped to the San Manuel Smelter or treatment.

Magma also operates a 29 mile railroad from San Manuel and a 28 mile railroad from Superior. Both connect to the Santa Fe Southern Pacific system.

A wholly owned subsidiary, MCR Products, consisting of a rod plant rated at 140,000 tons per year, in Chicago, Ill. was sold to Cyprus in February, 1990.

San Manuel Division

P.O. Box M, San Manuel, Arizona 85631 - Phone (602) 385-3100

The San Manuel Division consists of a block-caving underground copper- molybdenum mine, a 62,000 ton per day concentrator, an open pit oxide copper mine, pad leach, in-situ leach, SX-EW plant, a 1,000,000 ton per year smelter with a 3000 ton per day acid plant and a 300,000 ton per year electrolytic refinery and a 180,000 ton per year rod plant.

After development of the grizzly and haulage levels, caving is initiated by undercutting the ore block. The caved ore is drawn through the grizzlies to the haulage level. Haulage to the production shafts is by 23 ton trolley locomotives pulling ten 15-17 ton ASEA cars or fifteen 12-13 ton rotary dump cars. After hoisting to the surface the ore is hauled by rail to the mill in 100 ton cars in groups of 35 to 40 pulled by 125 ton diesel-electric locomotives. Development of the Kalamazoo ore body continued and production was commenced in the third quarter of 1990.

The Outokumpu Flash Smelting Furnace, at a design capacity of 3000 tons of concentrate per day, is the largest single furnace smelter in the industry. An oxygen plant and modifications to the acid plant were a part of the modernization.

Mining at the open pit oxide mine is accomplished with front end loaders with truck haulage at the rate of 28,000 tons of ore and 65,000 tons of waste per day. Ore is placed on the polyethylene lined leach pads and some

of the waste is dumped in the subsidence area. Any sulfide ore that is encountered is hauled to a railroad siding and added to the feed going to the concentrator. Copper is recovered from the leach solutions at the SX-EW plant that uses the ISA process of plating the copper on stainless steel sheets rather than on copper starter sheets. The solutions from the in-situ leaching are also fed to this plant that was expanded to a capacity of 75,000 tons of copper per year.

Cathodes from the electrolytic refinery and the SX-EW plant are melted and cast into continuous rods at the rod plant.

Pinto Valley Division

P.O. Box 100, Miami, Arizona 85631 - Phone (602) 425-7611

The Pinto Valley Division consists of the Pinto Valley Unit and the Miami Unit. At the Pinto Valley Unit mining is accomplished with electric shovels and truck haulage to the 63,000 ton per day concentrator. A dump leaching and an 8000 tons per year SX-EW plant are also in operation. The concentrates and cathodes are shipped to San Manuel.

At Miami solutions from the in-situ leaching of the old Miami Copper block cave area are treated by SX-EW. Construction of the project to slurry and leach the Miami Copper Company tailings from #2 tailing dam was completed in 1989. This is a process to slurry the tailings by hydraulic mining, leach with sulfuric acid, thicken, extract the copper at the SX-EW plant, and pump the tailings to the mined out Cities Service pit at Sleeping Beauty. To accommodate the additional solution the solvent extraction plant at Miami was modified and the electrowinning tank house was expanded to a capacity of 6,000 tons per year of copper. The tailing thickeners at the old mill were rebuilt to separate the pregnant solution from the solids after leaching.

PHELPS DODGE CORPORATION

Corporate Headquarters - 2600 North Central Avenue, Phoenix, Arizona 85004- 3015 - Phone (602) 234-8100

Phelps Dodge Mining Company was formed in September, 1988 as one of two operating divisions of Phelps Dodge Corporation. It is the nation's largest copper producer and accounts for about one-third of the nation's copper production at its mines in southeastern Arizona and southwestern New Mexico. In conjunction with its Arizona operations, Phelps Dodge operates the Hidalgo Smelter near Playas, New Mexico, a 420,000 ton per year refinery at El Paso Texas, a mine at Tyrone and the Chino Mine near Silver City, New Mexico in which it acquired a two-thirds interest from Kennecott at the end of 1986.

The Chino Mines Branch consists of an open pit copper mine, a 45,000 ton per day concentrator, a dump leach precipitation plant, a 500,000 ton per year INCO Flash smelter with an acid plant, and a 45,000 ton per year solvent extraction-electrowinning plant. The mine and concentrator are located at Santa Rita about 15 miles east of Silver City. The smelter is located about 9 miles south of the mine at Hurley.

The Hidalgo smelter near Playas, New Mexico is an OutoKumpo flash furnace rated at 500,000 tons per year. During 1986 the oxygen enrichment plant from the Morenci smelter was installed to increase capacity and efficiency. The resulting increase in sulfur dioxide concentration of the gases improved the operation of the acid plant as well.

The development of an underground mine at the Dos Pobres property near Safford, Arizona was suspended in 1982, allowed to flood in August 1984, and remains inactive. In 1986 Phelps Dodge acquired the nearby Lone Star property from Kennecott.

At Copper Basin near Prescott, Phelps Dodge has continued to pursue a land trade with the Forest Service. This property is being considered as a possible replacement for the Tyrone operation that is scheduled to cease mining operations in the early 1990's.

In addition to its Arizona-New Mexico copper properties Phelps Dodge operates a fluorspar mine in South Africa through its wholly owned subsidiary Phelps Dodge Mining (Pty) Limited and two copper-gold mines in Chile through its wholly owned subsidiary Compania Minerao Ojos del Salado SA. It also has interests in Black Mountain Mining Development Company (Pty) Limited, which operates a major lead-silver-zinc-copper mine in South Africa, and Southern Peru Copper Corporation in Peru.

Phelps Dodge Industries, the other operating division of Phelps Dodge Corporation, produces carbon black through its wholly owned subsidiary Colombian Chemical Company, wheels and rims for heavy trucks through Accuride Corporation acquired in March, 1988, and Magnet Wire, etc. through Phelps Dodge Magnet Wire Company.

Morenci Branch

Morenci, Arizona 85540 - Phone (602) 865-4521

The Morenci Branch consists of the combined Morenci-Metcalf open pit copper mine, the 60,000 ton per day Morenci concentrator with a molybdenum circuit, the 40,000 ton per day Metcalf concentrator, and a dump leach - SX-EW operation. The 650,000 ton per year smelter with a 2400 ton per day acid plant remain inactive and will require extensive modifications to meet air quality restraints if ever reactivated. Sumitomo Mining Arizona, Inc. holds an undivided 15% interest in the Morenci branch excluding the inactive smelter.

Mining is conducted with electric shovels and truck haulage utilizing a computer controlled Modular Mining Truck Dispatching System for maximum efficiency. During 1989 the completion of the in pit crushing and conveying (IPCC) system eliminated rail haulage completely. The trucks are dumped into the two semi-mobile primary crushers in the pit and the crushed ore is conveyed to the coarse ore stockpile by conveyor belt. Each concentrator is fed by conveyors running under the stockpile. Both concentrators are standard flotation mills except that column flotation cells have been installed in the cleaner circuit of each.

All mined material other than ore is classified as leach material and is taken to one of several leach dumps. There are three widely spaced solvent extraction plants to upgrade the solutions before they are pumped to the centrally located tank house for electrowinning.

Phelps Dodge completed the relocation of 2.2 miles of U.S. Highway 666 at Morenci as part of the Northwest Extension project. This project includes the expansion of the SX-EW capacity by 90,000 tons per year to 170,000 tons.

The "discovery" of the Coronado ore body adjacent to the Northwest Extension was announced.

Additional in-put crushing capacity is being provided to facilitate re-entry into the Metcalf mine area. The loading and hauling equipment in the pit were upgraded.

An additional ball mill was installed at the Morenci concentrator and the flotation cells at the metcalf concentrator are being replaced by larger units to increase capacity.

Copper Queen Branch

Highway 92, Bisbee, Arizona 85603 - Phone (602) 432-3621

The Copper Queen facility consists of a dump leaching and precipitation operation at the mined out Lavender pit.

A drilling program on an area north of the Lavender pit was conducted in 1987 to define a possible ore body amenable to treatment by heap leaching and SX-EW.

New Cornelia Branch

Ajo, Arizona 85321 - Phone (602) 387-7451

The New Cornelia Branch consists of an open pit copper mine, a 30,000 ton per day concentrator with a molybdenum circuit and a 190,000 ton per year smelter with an acid plant. The mine has been inactive since August 1984 and the smelter was shut down in April 1985. There are no immediate plans to reactivate the operation but it is being considered as a replacement for the Tyrone operation if economic conditions are suitable in the early 1990's.

SEVERANCE TAX ON METALLIFEROUS MINERALS

Background

Laws of 1982, Chapter 230, repealed the tax on sales of metalliferous minerals and enacted a severance tax in its place. Under the provisions of the severance tax, metalliferous minerals were to be taxed at the time of production, not at the time of sale. All metalliferous minerals produced after 1982 were to be taxed on the greater of the following 2 values:

1. The "weighted mineral value" which is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed, or
2. A specified percentage of the old sales tax base.

The severance tax was to be levied on metalliferous minerals at a rate of 2 1/2 percent. Unless otherwise provided by law, the tax was to be administered in the same manner as the sales tax. As a result, severance tax payments were due on the first day of the second month following the month in which the tax accrued. From January 1, 1983 through June 30, 1983, 40 percent of the severance tax was to be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). In subsequent fiscal years, a progressively larger share of the severance tax was to be distributed in the same manner as the transaction privilege tax. The balance of severance tax collections, after making this distribution, was to be deposited each year in the state's general fund. (Effective from and after December 31, 1982.)

Laws of 1983, Chapter 4 changed the due date for payment of the Severance Tax to the twentieth day of the month following the month in which the tax accrues. Taxes were to be delinquent if not received by the Department of Revenue on the day preceding the last day of the month in which they were due. (Effective April 1, 1983). The law also changed the interest rate on delinquent tax payments to equal the rate established by Section 6621 of the Internal Revenue Code, compounded annually. (Effective February 11, 1983.)

Legal Citation

A.R.S. 42-1461 - 42-1466.

Paid by

Persons engaged in the business of extracting substances from the earth that become metalliferous minerals (A.R.S. 42-1461 - 42-1462.)

Exemptions

None.

Tax Base

The severance tax is levied on the "net severance base" of all metalliferous minerals produced after 1982 (42-1462). The "net severance base" is the greater of the following 2 values (42-1464, Laws of 1982, Chapter 230, Section 12):

1. The "weighted mineral value", or
2. A specified percentage of the old sales tax base (the gross value of production less out-of-state processing costs). This value will be referred to as the "Arizona value" after June 30, 1985.

The "weighted mineral value" is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed.

The "weighted mineral value" is determined using the following formula (42- 1464):

$$\text{weighted mineral value} = \frac{\text{mining costs} \times \text{gross value of production}}{\text{total production costs}}$$

where:

mining costs represent the cost of extracting the minerals from the earth and delivering them to the site where they will be processed further (42-1461).

- total production costs include most of the major costs incurred in mining and processing minerals until the point of sale (42-1461).
- gross value of production is determined by multiplying the recoverable units of a metallic product by the per unit price of the product; the price per unit does not include the cost of manufacturing, fabricating or otherwise transforming a refined mineral product, when these activities occur prior to sale of the product (42-1461).

Although metalliferous minerals will no longer be taxed on the old sales tax base, the value of minerals produced after 1982 may not fall below a specified percentage of the old tax value (42-1464, Laws of 1982, Chapter 230, Section 12). The old tax value included not only the cost of extracting the minerals from the earth, but most of the major in-state costs of producing the minerals. This value was determined by multiplying the recoverable units of a metallic product by the per unit price and deducting the out-of-state processing costs from the result (42-1464; Laws of 1982, Chapter 230, Sec-

tion 12; 41-1461). The following table shows the minimum percentage of the old tax value that may be assigned to minerals for severance tax purposes (42-1464; Laws of 1982, Chapter 230, Section 12):

Period during which minerals are produced	Minimum value of minerals for purposes of determining the severance tax
Jan. 1, 1983 - June 30, 1983	100% of the old taxable sale value
July 1, 1983 - June 30, 1984	831/3% of the old taxable sale value
July 1, 1984 - June 30, 1985	66 2/3% of the old taxable sale value
July 1, 1985 and thereafter	50% of the old taxable sale value

Tax Rate

2.5% of the net severance base.

Due Date

Collections from the severance tax on metalliferous minerals are due on the twentieth day of the month following the month in which the tax accrues. Taxes are delinquent if they are not received by the Department of Revenue on the day preceding the last day of the month in which they are due. The due date may be extended by the Department of Revenue for good cause, but not beyond the first day of the third month following the regular due date (42- 1465, 42-1322).

Collecting Agency

Department of Revenue. (42-1462, 42-101)

Dedication or Purpose

To aid in defraying the necessary and ordinary expenses of the state, cities, and counties to reduce or eliminate the annual tax levy on property for state, city and county purposes and to reduce the levy on property for public school education (Laws of 1982, Chapter 230, Section 17).

Yield

Fiscal Year	Net Collections
1989-90	$543,461
1988-89	563,534
1987-88	557,476
1986-87	480,535
1985-86	376,947
1984-85	197,920
1983-84	102,305
1982-83	33,425

Source: Department of Revenue, Annual Reports.

Distribution

Each year, a portion of severance tax collections will be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). The portion of collections that is distributed in this manner will increase each fiscal year until 1986-87. The table below shows the amount of severance tax collections that will be distributed in the same manner as transaction privilege taxes during each fiscal year (42-1465, Laws of 1982, Chapter 230, Section 16).

Period during which collections are received	Portion of severance tax collections distributed in the same manner as the transcation privilege tax
January 1, 1983 - June 30, 1983	40%
July 1, 1983 - June 30, 1984	48%
July 1, 1984 - June 30, 1985	60%
July 1, 1985 and thereafter	80%

After making this distribution the balance of severance tax collections will be deposited each year in the state's general fund and is appropriated for public educational purposes (42-1465; Laws of 1982, Chapter 230, Section 16).

Source: State of Arizona Tax Handbook - 1990

Prepared by the Staff of the Joint Legislative Budget Committee

PROPERTY TAX

The following has been excerpted from *Appraisal Manual for Mines and Natural Resources* by Donald E. Ross of the Arizona Department of Revenue which was effective as of January 1, 1988 and is revised annually.

The Natural Resource Unit of the Division of Property Valuation and Equalization is assigned the responsibility of valuing producing and nonproducing mines and oil, gas, and geothermal interests. Arizona Department of Revenue mine valuation regulations R15-4-201 through R15-4-206 are incorporated into this manual.

Arizona Revised Statutes (ARS Section 42-201.8) states:

"Producing mine or mining claim" means any mine or mining claim from which any coal, mineral or mineral substance, other than clay, sand, gravel, building stone or any mineral substance normally processed into artificial stone, has been extracted for commercial purposes at any time during a period of one year prior to the first Monday in January of the tax year."

A producing mine includes the land utilized for mining purposes together with structures and facilities necessary to sustain mining operations. It also includes equipment used directly in the process of extracting ores or minerals from the earth for commercial purposes, including equipment required to prepare the materials for extraction and the handling, loading or transportation of such extracted material to the surface. Mining includes underground, surface and open-pit operations for the extraction of ores and minerals.

If mining operations cease, real and personal property associated with a mining operation will continue to be valued by Centrally Valued Properties for a period of three years. The nonoperating mine will be retained in the legal class 1 for the first year after mining operations are terminated. The legal class designation used for the next two years will depend on the use of the property, which could be class 4 if the property remains idle.

Three years after mining operations have ceased, the valuation of the nonproducing mining property will be transferred from the Centrally Valued Properties' jurisdiction to the Locally Valued Properties' jurisdiction. From this point on, the county assessor is responsible for classifying and valuing the subject property. Such property will be classified according to its current use. If the real and/or personal property is idle at the expiration of the three-year period, it normally will be classified legal Class Four property.

The Natural Resource Unit of the Centrally Valued Properties Section of the Arizona Department of Revenue is responsible for determining annually the value of all producing mines as of the first day of January of the tax year. Property within the context of a producing mine excludes manufacturing operations such as a rod plant. In summary, the value of taxable producing mine property for Arizona property tax purposes includes land, supplies inventories, ore reserves, construction work in progress, personal property and improvements.

Summary of Procedures

Producing mines are taxed on the basis of their assessed value multiplied by the local tax rate which produces the tax due. The assessment ratio for 1988 is 28% of the full cash value or market value. The full cash value is determined by the mineral property appraiser after correlating the three approaches to value, namely the income, cost and market approaches.

The income approach consists of discounting two different future income streams as developed by (1) the mining company and (2) by the Department utilizing a single rate factor. The Department has developed a method in which a five-year history, expressed as a profit margin, is combined with the future production schedule to produce a future income stream. The historical data are expressed on a production basis, not on a sales basis. This five-year margin method avoids the problems of predicting the future price of copper and other metals. It is supported in the literature and has been approved by the Arizona Supreme Court. The past is only a valid indicator of the performance level of a relatively stable operation and should not be used for new or dying mines. The historical data are averaged to flatten the effects of the peaks and it is generally accepted as standard for financial reporting, and the Securities and Exchange Commission reports.

Cost approach values are determined by computing the reproduction cost new less depreciation for the physical assets. Straight line deprecations is utilized along with appreciation or inflation factors as developed by the Department (Table I). Economic and functional obsolescence can be allowed for by the appraiser if warranted.

Comprehensive field notes are written for each mine annually. Contacts with the mining industry are maintained in order to keep abreast of development in technology and discount rates. Technical papers and literature are collected, indexed, and placed in the listing of references for each mine appraisal report. Detailed production statistics are maintained in order to analyze the historical performance for the mine.

TABLE I
COPPER AND MOLBYDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1990

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
ARIMETCO					
Emerald Isle (1)					
In-Situ/Cementation			26,000		
Johnson (2)					
Heap Leach/SX-EW			2,852,000		
Total			2,878,000		
(1 Shut down after 1st quarter of 1990					
(2 Started leaching 1990					
ASARCO, INC.					
Mission Unit					
Sulfide	10,885,000	10,885,000	133,973,000		31,202,000
San Xavier	2,968,000	2,968,000	25,528,000		17,941,000
Ray Unit					
Sulfide	10,860,000	10,860,000	161,855,000		27,646,000
Oxide	3,401,000				
Heap Leach/SX-EW			60,021,000		
Dump Leach/SX-EW			21,776,000		
Silver Bell Unit					
Dump Leach/Cementation			8,480,000		
Total	28,114,000	24,713,000	411,633,000		76,789,000

Continued

TABLE I
COPPER AND MOLBYDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1990

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
CYPRUS MINERALS CO.					
Bagdad					
Sulfide	24,680,000	23,419,000	191,653,000	8,753,000	28,998,000
Dump Leach/SX-EW			23,419,000		
Casa Grande					
In-Situ/SX-EW			2,500,000		
Miami					
Oxide					
Heap Leach/SX-EW (1	24,649,000		121,702,000		13,480,000
Mineral Park					
In-Situ/Cementation			2,000,000		
Dump Leach/Cementation			2,000,000		
Sierrita					
Sulfide	31,268,000	31,268,000	155,071,000	14,563,000	24,724,000
Dump Leach/SX-EW			9,383,000		
Twin Buttes					
Sulfide (2	5,730,000	5,730,000	81,925,000	1,136,000	24,288,000
Oxide					
Agitation Leach/SX-EW (3	830,000		30,919,000		
Total	87,157,000	60,417,000	620,572,000	24,452,000	91,490,000

(1 Although some of this production is from old dumps, it is undifferentiated and is reported as heap leach.

(2 Sulfide ore is concentrated at Sierrita.

(3 Includes production from ore stockpiles, reclaimed sulfide tailings and newly mined ore.

Continued

TABLE I
COPPER AND MOLBYDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1990

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
MAGMA COPPER CO.					
Pinto Valley Division					
Sulfide	23,441,000	23,450,000	161,720,000	1,208,000	30,451,000
Dump Leach/SX-EW			14,067,000		
Miami					
In-Situ			9,738,000		
No. 2 Tailings	3,876,000		8,150,000		
San Manuel Division					
Underground-Sulphide	16,700,000	16,700,000	185,211,000	3,200,000	
Open Pit-Oxide	10,870,000				19,552,000
Heap Leach/SX-EW			55,400,000		
In-Situ/SX-EW			25,000,000		
Superior Division (1					
Underground Sulfide	67,000	73,000	5,777,000		
Total	54,954,000	40,223,000	465,063,000	4,408,000	50,003,000

(1 September through December.

Continued

TABLE I
COPPER AND MOLBYDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES
1990

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
PHELPS DODGE CORP.					
Copper Queen Branch					
Dump Leach/Cementation			3,100,000		
Morenci Branch (1					
Sulfide	42,943,000	43,107,000	470,505,000	474,000	77,895,000
Dump Leach/SX-EW			200,823,000		
Total	42,943,000	43,107,000	674,428,000	474,000	77,895,000
(1 Includes Sumimoto's 15%.					
TOTALS					
Sulfide	169,542,000	168,460,000	1,573,218,000	29,334,000	263,145,000
Oxide (Leach)	43,626,000				33,032,000
Heap Leach/SX-EW			239,975,000		
Dump Leach/SX-EW			269,468,000		
Dump Leach/Cementation			13,580,000		
In-Situ/SX-EW			37,238,000		
In-Situ/Cementation			2,026,000		
Agitation Leach/SX-EW			39,069,000		
Sub Total Leached			**601,356,000**		
SX-EW			585,750,000		
Cemented			15,606,000		
GRAND TOTAL	**213,168,000**	**168,460,000**	**2,174,574,000**	**29,334,000**	**296,177,000**

TABLE II
ARIZONA LEACH COPPER PRODUCTION (1
(Thousand Pounds)

MINE OPERATION	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
ARIMETCO										
Emerald Isle	--	--	--	--	--	--	--	--	48	26
Johnson (2	10,693	9,702	--	8,803	6,200	--	--	--	--	2,852
Van Dyke (3						--	--	67	654	--
ASARCO INCORPORATED										
Silver Bell	7,950	8,687	10,374	9,152	8,800	6,814	12,800	8,660	10,017	8,480
Ray (4	25,788	22,420	20,033	20,457	23,706	56,639	68,543	76,966	79,933	81,797
CYPRUS MINES CORP.										
Bagdad	13,244	13,173	13,282	14	14,259	13,958	16,470	19,100	22,262	23,419
Bluebird (5	13,328	NR	--	--	--	--	--	--	--	--
Casa Grande (6	26,071	45,611	3,244	15,401	13,514	7,100	4,145	4,300	5,000	2,500
Miami (7	50,532	50,000	78,988	79,549	85,136	98,747	105,555	115,293	124,367	121,702
Mineral Park (8	4,194	3,191	3,101	2,718	3,798	4,251	4,405	4,500	3,338	4,000
Ox Hide (7	761	1,572	--	--	--	--	--	--	--	--
Sierrita/Esperanza (8	11,566	9,354	6,367	8,500	10,000	8,770	7,943	8,556	8,400	9,383
Twin Buttes (9	67,922	60,796	50,649	50,239	19,824	--	--	--	18,800	30,919
MAGMA COPPER CO.										
Copper Cities	3,622	2,046	--	--	--	--	--	--	--	--
Pinto Valley/Miami	15,736	26,958	24,632	25,602	23,947	22,252	22,724	23,413	21,013	31,955
San Manuel (10	--	--	--	--	--	21,923	51,278	62,956	68,855	80,400
PHELPS DODGE CORPORATION										
Copper Queen Branch	4,600	4,545	5,200	3,493	4,144	3,454	2,730	2,700	4,762	3,100
Morenci Branch	96,090	75,735	69,158	60,312	53,228	56,261	45,249	108,426	133,221	200,823
New Cornelia Branch	--	661	--	920	402	--	--	--	--	--

Continued

TABLE II
ARIZONA LEACH COPPER PRODUCTION (1
(Thousand Pounds)

MINE OPERATION	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
RANCHERS										
Old Reliable	149	--	--	--	--	--	--	--	--	--
TOTALS	**352,246**	**334,451**	**285,028**	**285,160**	**266,958**	**300,169**	**341,842**	**434,937**	**500,622**	**601,356**
PERCENT OF PRIMARY COPPER PRODUCED (11	**15.0**	**19.6**	**18.8**	**18.0**	**15.0**	**17.1**	**19.8**	**23.1**	**24.9**	**27.7**

(1 Copper recovered by precipitation or by solvent extraction from material dump, heap, vat or in-situ leached.
(2 Arimetco acquired Johnson Camp from Cyprus in August, 1989.
(3 Operated by Kocide 1988-89. Acquired by Arimetco in 1990.
(4 Asarco purchased Ray Unit from Kennecott November 18, 1986.
(5 Operated by Ranchers, became part of Inspiration Area Mines July, 1984 and Cyprus Miami July, 1988.
(6 Noranda Lakeshore through 6/31/87; Now Cyprus Miami July, 1988.
(7 Sold by Inspiration to Cyprus July 1, 1988.
(8 Cyprus purchased Sierrita/Esperanza and Mineral Park from Duval April 1, 1986.
(9 Operated by ANAMAX. Acquired by Cyprus March, 1988.
(10 Open pit, heap leach, SX-EW start-up in spring of 1986. Some in-situ production.
11(Leach copper compared to total copper produced as reported in this report, Table I.

Source: Arizona Department of Mines and Mineral Resources; this report, Table 1-11.

TABLE III
RANK OF ARIZONA'S COPPER COMPANIES BY PRODUCTION OF COPPER AND MOLYBDENUM 1990

	COPPER			MOLYBDENUM	
RANK	COMPANY	% OF AZ PRODUCTION	RANK	COMPANY	% OF AZ PRODUCTION
1	**Phelps Dodge Corp.** 674,428,000	31.0	1	**Cyprus Minerals Co.** 24,452,000	83.4
2	**Cyprus Minerals Co.** 620,572,000	28.6	2	**Magma Copper Company** 4,408,000	15.0
3	**Magma Copper Co.** 465,063,000	21.4	3	**Phelps Dodge Corp.** 474,000	1.6
4	**Asarco Inc.** 411,633,000	18.9			
5	**Arimetco** 2,878,000	0.1			
TOTAL	**2,174,574,000**	**100.0**		**29,334,000**	100.0

TABLE IV
RANK OF ARIZONA'S COPPER MINES
BY PRODUCTION OF COPPER AND MOLYBDENUM
1990

	COPPER			MOLYBDENUM	
RANK	COMPANY	% OF AZ PRODUCTION	RANK	COMPANY	% OF AZ PRODUCTIO
1	**Morenci/Phelps Dodge** 671,328,000	30.9	1	**Sierrita,Twin Buttes/ Cyprus** 15,699,000	53.5
2	**Sierrita,Twin Buttes/ Cyprus** 277,298,000	12.8	2	**Bagdad/Cyprus** 8,753,000	29.9
3	**San Manuel/Magma** 265,611,000	12.2	3	**San Manuel/Magma** 3,200,000	10.9
4	**Ray/Asarco** 243,652,000	11.2	4	**Pinto Valley/Magma** 1,208,000	4.1
5	**Bagdad/Cyprus** 215,072,000	9.9	5	**Morenci/Phelps Dodge** 474,000	1.6
6	**Pinto Valley,Miami/Magma** 193,675,000	8.9			
7	**Mission/Asarco** 159,501,000	7.3			
8	**Miami/Cyprus** 121,702,000	5.6			
9	**Silver Bell/Asarco** 8,480,000	0.4			
10	**Superior/Magma** 5,777,000	0.3			
11	**Mineral Park/Cyprus** 4,000,000	0.2			
12	**Copper Queen/Phelps Dodge** 3,100,000	0.1			
13	**Johnson/Arimetco** 2,852,000	0.1			
14	**Casa Grande/Cyprus** 2,500,000	0.1			
15	**Emerald Isle/Arimetco** 26,000	0.0			
TOTAL	**2,174,574,000**	**100.00**		**29,334,000**	**100.0**

TABLE V
ARIZONA MINE PRODUCTION
OF RECOVERABLE COPPER IN SHORT TONS

	1986		1987		1988		1989		1990	
BY MONTH	AMOUNT	% CHANGE	AMOUNT	% CHANGE	AMOUNT	% CHANGE	AMOUNT	% CHANGE	AMOUNT	% CHANGE
January	78,138	7.8	71,816	(8.1)	77,612	8.1	81,455	5.0	84,172	2.0
February	67,524	(0.4)	65,448	(3.1)	73,465	12.2	79,227	7.8	78,045	(2.8)
March	72,834	(5.1)	72,674	(0.2)	82,552	13.6	91,491	10.8	85,658	(7.4)
April	70,306	(7.4)	67,637	(3.8)	76,379	12.9	79,549	4.2	88,073	9.3
May	73,446	(4.2)	69,843	(4.9)	77,872	11.5	82,315	5.7	91,460	9.7
June	72,747	2.7	68,985	(5.2)	75,089	8.8	78,643	4.7	92,701	16.3
July	74,009	2.0	68,090	(8.0)	77,316	13.5	80,152	3.7	92,258	13.6
August	71,488	(3.6)	69,596	(2.6)	82,747	18.9	84,995	2.7	90,685	5.4
September	72,402	2.4	69,498	(4.0)	77,467	11.5	80,169	3.5	89,107	9.7
October	76,159	2.8	71,478	(6.1)	79,386	11.1	82,790	4.3	93,941	11.7
November	70,220	(3.6)	75,349	7.3	76,173	1.1	77,303	1.5	93,320	18.8
December	70,635	(10.6)	76,930	8.9	80,906	5.2	81,502	0.7	93,037	11.8
					CUMULATIVE YEAR TO DATE					
January	78,138	7.8	71,816	(8.1)	77,612	8.1	81,455	5.0	84,172	2.0
February	145,662	3.8	137,264	(5.8)	151,077	10.1	160,682	6.4	162,217	(0.4)
March	218,496	0.7	209,938	(3.9)	233,629	11.3	252,173	7.9	247,875	(2.9)
April	288,802	(1.4)	277,575	(3.9)	310,008	11.7	331,722	7.0	335,948	0.0
May	362,248	(2.0)	347,418	(4.1)	387,880	11.6	414,037	6.7	427,408	1.9
June	434,995	(1.2)	416,403	(4.3)	462,969	11.2	492,680	6.4	520,109	4.2
July	509,004	(0.1)	484,493	(4.8)	540,285	11.5	572,832	6.0	612,367	5.5
August	580,492	(1.1)	554,089	(4.5)	623,032	13.3	657,827	5.6	703,052	5.5
September	652,894	(0.8)	623,587	(4.5)	700,499	12.3	737,996	5.4	792,159	5.9
October	729,053	(0.4)	695,065	(4.7)	779,885	12.2	820,786	5.2	886,100	6.5
November	799,273	(0.7)	770,414	(3.6)	856,058	11.1	898,089	4.9	979,420	7.5
December	869,908	(1.6)	847,344	(2.6)	936,964	11.2	979,591	4.5	1,072,457	7.9
AVERAGE MONTH	72,492	(1.6)	70,612	(2.6)	78,080	10.6	81,633	4.5	89,371	7.9

NOTE: Percentage change column shows change from corresponding period in prior year. Parentheses indicate a negative change.
Source: U.S. Department of the Interior, Bureau of Mines
Prepared By: State of Arizona Joint Legislative Budget Committee

TABLE VI
AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES
(Percent Total Copper)

MINE OPERATION		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
ASARCO INCORPORATED											
Mission (1	Sulfide	0.75	(0.75)	(0.75)	(0.75)	0.65	0.70	0.67	0.73	0.70	0.72
Pima (1	Sulfide	0.49	0.48	--	--	--	--	--	--	--	--
Ray Unit (2 (3	Sulfide	0.97	0.80	1.19	1.13	0.99	0.99	0.89	1.00	0.97	0.88
	Oxide (Silicate)	--	--	--	--	1.17	1.23	1.15	1.11	1.13	1.05
San Xavier (1	Sulfide	0.65	(0.65)	(0.51)	(0.51)	--	--	--	--	0.55	0.54
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	0.50	0.50	0.50	0.45	0.44	0.45	0.48	0.45	0.49	0.53
Bluebird (4	Oxide	0.40	--	--	--	--	--	--	--	--	--
Christmas (OP) (5	Sulfide	0.62	--	--	--	--	--	--	--	--	--
Esperanza (6	Sulfide	0.29	0.29	--	--	--	--	--	--	--	--
Johnson	Oxide	0.40	0.40	0.40	0.71	--	--	--	--	--	--
Lakeshore	Oxide	1.00	1.00	(1.00)	(1.00)	--	--	--	--	--	--
Miami (5	Sulfide	0.58	0.58	0.53	0.55	0.60	0.54	--	--	--	--
	Oxide	--	--	--	0.50	0.49	0.57	0.59	0.52	0.49	0.44
Mineral Park (6	Sulfide	0.32	--	--	--	--	--	--	--	--	--
Sierrita (6	Sulfide	0.30	0.30	(0.30)	0.34	0.33	0.34	0.33	0.30	0.31	0.31
Twin Buttes (7	Sulfide	0.74	0.78	0.57	--	--	--	--	3.39	1.90	0.99
	Oxide	1.20	1.06	0.93	0.86	0.84	--	--	1.22	1.13	0.99
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	0.46	0.46	--	0.44	0.45	0.45	0.36	0.37	0.46	0.44
San Manuel	Sulfide	0.64	0.66	0.64	0.64	0.61	0.62	0.62	0.63	0.64	0.65
	Oxide	--	--	--	--	--	0.58	0.64	0.61	0.56	0.55
Superior	Sulfide	4.48	4.32	--	--	--	--	--	--	--	5.26
PHELPS DODGE CORPORATION											
Morenci /Metcalf	Sulfide	0.74	0.71	0.73	0.81	0.86	0.84	0.82	0.88	0.79	0.74
New Cornelia	Sulfide	0.50	0.64	0.60	0.55	--	--	--	--	--	--
WEIGHTED AVERAGE (8		0.58	0.59	0.65	0.70	0.62	0.61	0.58	0.60	0.62	0.58

Continued

TABLE VI
AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES
(Percent Total Copper)

() Percentage in parenthesis is approximate: Not used in calculation of weighted average.
(1 Combined as Mission complex in 1985.
(2 Ray Unit acquired from Kennecott, November 18, 1986.
(3 Grade reported for Ray Unit is an average of oxide and sulfide together through 1984.
(4 Bluebird property acquired by Inspiration in 1984 and by Cyrpus as part of Cyprus Miami March, 1988.
(5 Acquired from Inspiration July 1, 1988.
(6 Sierrita, Esperanza and Mineral Park acquired from Duval Corp., April 1, 1986.
(7 Included AMAX share of Palo Verde deposit for 1979-1982. Acquried by Cyprus March, 1988.
(8 Weighted average grade or ore milled, based generally on an assay of total copper.

Source: Company annual reports, Form 10-K's and Prospectus: personal correspondence and Arizona Departent of Mines and Mineral Resources.

TABLE VII
PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES
(Percent of Total Copper)

MINE OPERATION		1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
ASARCO INCORPORATED											
Mission (1	Sulfide	94	85	80	(80 est)	92	91	89	87	84	86
Pima (1	Sulfide	76	89	--	--	--	--	--	--	--	--
Ray (2	Sulfide	70	70	(70 est)	83	81	82	84	83	81	84
San Xavier (1	Sulfide	76	78	79	(80 est)	--	--	--	--	79	79
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	94	83	83	92	91	93	90	91	84	70
	Oxide	--	--	--	52	51	54	42	46	90	91
Bluebird (3 (4	Oxide	156	--	--	--	--	--	--	--	--	--
Christmas (OP) (6	Sulfide	71	--	--	--	--	--	--	--	--	--
Esperanza (5	Sulfide	87	--	--	--	--	--	--	--	--	--
Johnson	Oxide	86	--	62	(62 est)	--	--	--	--	--	--
Miami (7	Sulfide	74	68	86	80	76	66	69	N/A	93	91
Mineral Park (5	Sulfide	75	--	--	--	--	--	--	--	--	--
Sierrita (5	Sulfide	80	98 (?)	(88 est)	89	92	91	89	87	86	87
Twin Buttes (8	Sulfide	85	--	--	--	--	--	--	87	83	84
	Oxide	77	87	(80 est)	80	(80 est)	--	--	--	72	71
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	94	95	--	88	80	84	82	84	82	86
San Manuel	Sulfide	87	89	86	90	90	90	85	86	82	85
Superior	Sulfide	93	(93 est)	--	--	--	--	--	--	--	94
PHELPS DODGE CORP.											
Morenci/Metcalf	Sulfide	69	68	71	70	86	76	74	72	73	77
New Cornelia	Sulfide	78	85	78	76	--	--	--	--	--	--

TABLE VII
PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES
(Percent of Total Copper)

(1 Combined as Mission complex in 1985.
(2 Ray Unit acquired from Kennecott, November 18, 1986.
(3 Bluebird property acquired by Inspiration in 1984 and by Cyprus Miami, July 1, 1988.
(4 Recovery by leaching heaps continued after mining was terminated in July 1981.
(5 Sierrita, Esperanza, and Mineral Park acquired from Duval Corp., April 1, 1987.
(6 Acquired from Inspiration , July 1, 1988.
(7 Percent recovery by leaching since 1986. Acquired from Inspiration July 1, 1988.
(8 Recovery includes AN AM AX's share of Palo Verde 1981-1982-1983-1984. Acquired by Cyprus in March, 1989.

TABLE VIII
STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES (1
(Waste:Ore)

MINE OPERATION	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
ASARCO INCORPORATED										
Eisenhower (2 (3	0.71:1	0.67:1	0.57:1	1.26:1	--	--	--	--	--	--
Mission (3	2.01:1	1.62:1	2.52:1	1.32:1	0.74:1	0.84:1	1.05:1	2.02:1	1.41:1	2.87:1
Pima (3	3.06:1	1.42:1	--	--	--	--	--	--	--	--
Ray (4	1.88:1	2.30:1	2.72:1	2.11:1	2.27:1	2.12:1	1.99:1	2.10:1	1.70:1	1.90:1
Sacaton	1.30:1	0.70:1	0.35:1	0.10:1	--	--	--	--	--	--
San Xavier (3	6.18:1	2.90:1	0.96:1	1.97:1	--	--	--	--	6.72:1	6.05:1
Silver Bell	1.41:1	--	1.09:1	1.17:1	--	--	--	--	--	--
CYPRUS MINES CORPORATION										
Bagdad	1.78:1	1.45:1	1.53:1	0.94:1	0.42:1	0.54:1	0.77:1	1.96:1	1.23:1	1.17:1
Bluebird (5 (6	0.003:1	--	--	--	--	--	--	--	--	--
Christmas (7	3.24:1	--	--	--	--	--	--	--	--	--
Esperanza (8	1.95:1	--	--	--	--	--	--	--	--	--
Johnson	1.52:1	--	0.03:1	--	--	--	--	--	--	--
Miami (7	1.53:1	1.42:1	0.27:1	1.72:1	1.50:1	1.82:1	2.04:1	2.01:1	0.96:1	0.55:1
Mineral Park (8	1.44:1	--	--	--	--	--	--	--	--	--
Sierrita (8	0.98:1	0.55:1	0.33:1	0.76:1	0.55:1	0.19:1	0.40:1	0.67:1	0.77:1	0.79:1
Twin Buttes (9	3.62:1	2.05:1	1.14:1	--	--	--	--	34.60:1	8.37:1	4.38:1
MAGMA										
San Manuel Oxide	--	--	--	--	--	1.70:1	2.46:1	2.32:1	2.45:1	1.80:1
Pinto Valley	1.77:1	1.80:1	--	0.79:1	1.01:1	1.21:1	1.32:1	1.39:1	1.53:1	1.27:1
PHELPS DODGE CORPORATION										
Morenci/Metcalf	1.63:1	0.79:1	0.64:1	0.90:1	0.68:1	0.76:1	1.10:1	1.13:1	1.22:1	1.81:1
New Cornelia	0.48:1	1.21:1	0.30:1	0.58:1	--	--	--	--	--	--
WEIGHTED AVERAGE*	**1.57:1**	**1.31:1**	**0.57:1**	**1.10:1**	**0.88:1**	**0.96:1**	**1.21:1**	**1.49:1**	**1.46:1**	**1.57:1**

TABLE VIII
STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES (1
(Waste:Ore)

Continued

(1 Leachable rock included with waste (except at solely leach operations).
(2 Mining was done by ASARCO, includes ANAMAX's share of ore.
(3 Combined as Mission Complex in 1985.
(4 Ray Unit acquired from Kennecott, November 18, 1986.
(5 Stripping of overburden ceased in January, 1981 but mining continued until July.
(6 Bluebird property acquired by Inspiration in 1984 and by Cyprus as part of Cyprus Miami July 1, 1988.
(7 Acquired from Inspiration July 1, 1988.
(8 Sierrita, Esperanza and Mineral Park acquired from Duval April 1, 1986.
(9 Acquired by Cyprus March, 1988

Source: "Minerals Yearbook - Area Reports: Domestic," U.S. Bureau of Mines; Company Annual Reports; E&MJ International Directory of Mining and Mineral Processing Operations; Arizona Department of Mines and Mineral Resources; Company submitted data beginning in 1985.

**Note: These are now weighted averages so use caution in making comparisons to the averages presented in previous editions of this report prior to 1981.*

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLOYBDENUM, GOLD AND SILVER

RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 Pounds Value	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1972	165,914,825	102,526	6,614,957	27,126,000	1,695,858,000	10.22	
		5,987,518	11,143,226	46,791,000	858,392,446	50.617	922,314,190
1973	181,311,945	102,376	7,164,988	37,657,000	1,735,012,000	9.57	
		10,013,397	18,325,173	59,372,000	1,021,314,814	58.865	1,109,025,384
1974	178,913,296	90,206	6,308,721	28,346,000	1,609,808,000	9.00	
		14,488,424	29,701,332	57,067,000	1,233,901,735	76.649	1,335,158,491
1975	168,750,152	82,759	6,190,805	25,030,000	1,502,978,000	8.91	
		13,364,751	27,354,196	61,411,000	954,917,072	63.535	1,057,047,019
1976	194,136,559	97,961	7,308,395	31,073,000	1,912,430,000	9.85	
		12,276,473	31,816,805	89,148,000	1,316,210,823	68.824	1,449,452,101
1977	168,641,401	87,874	6,696,415	34,574,000	1,705,240,000	10.11	
		13,032,593	30,957,660	120,497,000	1,122,184,339	65.808	1,166,295,089
1978	178,204,491	92,508	6,611,781	33,029,000	1,817,670,000	10.20	
		17,905,108	35,709,502	150,142,000	1,190,755,617	65.510	1,244,520,369

Continued

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLOYBDENUM, GOLD AND SILVER RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 Pounds Value	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1979	203,977,408	99,549 30,622,766	7,454,306 82,699,941	35,101,000 213,065,000	1,914,501,095 1,767,735,441	9.39 92.334	2,094,081,895
1980	169,650,401	71,533 43,814,606	5,640,703 116,376,559	36,299,000 324,150,000	1,521,850,812 1,543,400,219	8.97 101.416	2,027,741,384
1981	216,787,430	95,496 43,891,299	7,565,368 79,575,340	35,600,000 273,052,000	2,143,898,000 1,795,385,941	9.89 83.744	2,191,904,580
1982	146,124,870	61,050 22,949,000	6,301,000 50,090,000	22,099,000 100,673,000	1,697,500,000 1,261,415,000	11.62 74.31	1,435,127,000
1983	152,902,150	61,991 26,284,000	4,492,000 51,383,000	23,934,000 79,459,000	1,495,208,000 1,144,285,000	9.78 76.53	1,301,411,000
1984	145,278,431	51,548 18,591,200	4,093,000 33,320,000	23,184,000 78,827,000	1,582,549,000 1,044,483,000	10.89 66.00	1,175,151,000
1985	159,547,970	52,053 16,585,000	4,885,000 30,007,000	30,428,000 98,827,000	1,778,334,456 1,166,571,000	11.14 65.60	1,311,990,000

Continued

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLOYBDENUM, GOLD AND SILVER RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 Pounds Value	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1986	153,439,000	63,334	4,202,000	29,382,000	1,752,525,000	11.42	
		23,370,000	22,987,000	75,607,000	1,157,543,000	66.05	1,279,507,000
1987	166,113,000	48,430	3,530,000	15,939,000	1,724,068,000	10.38	
		21,694,000	24,745,000	51,802,000	1,370,924,000	79.52	1,469,165,000
1988	175,261,000	60,981	4,766,000	29,132,000	1,885,112,000	10.76	
		26,972,000	31,157,000	78,074,000	2,243,283,000	119.00	2,379,436,000
1989	196,684,000	44,959	5,312,000	29,795,000	2,009,782,000	10.22	
		17,283,000	29,367,000	99,545,000	2,592,723,000	129.01	2,738,918,000
1990	213,168,000	44,000 (e)	4,069,000 (e)	29,334,000	2,174,574,000	10.20	
		17,024,000	19,613,000	82,429,000	2,648,631,000	121.80	2,767,697,000

Source: Table I, this publication - U.S. Bureau of Mines State Mineral Summaries.

(1 Molybdenum content of recovered concentrate.

(2 Excludes precipitate copper from dump and in-place leaching prior to 1982.

(3 At average annual domestic, free market gold price.

(4 At E&MJ average annual N.Y. market price for .999 fine silver.

(5 At E&MJ average annual price, U.S. Producer Cathode Preliminary.

(e Estimated

TABLE X
NONFUEL MINERAL PRODUCTION IN ARIZONA /1

MINERAL	1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ----------short tons --	211,580	$2,010	193,743	1,930
Copper (2 ----------metric tons --	890,940	2,592,793	963,189	2,633,098
Diatomite ----------short tons --	8,100	1,208	W	W
Gem Stones ----------	NA	3,300	NA	2,821
Gold (2----------kilograms --	2,849	35,264	2,759	33,708
Lime ----------do. --	W	W	W	W
Iron oxide pigments (crude) metric tons --	W	W	14	18
Pumice ----------thousand short tons --	--	--	--	--
Sand and Gravel:				
Construction ----------	e/33,800	e/133,500	32,100	129,200
Industrial ----------	W	W	W	W
Silver (2 ----------	171	30,186	131	21,059
Stone:				
Crushed -----thousand short tons --	6,649	28,552	3,000	13,500
Dimension ----------short tons --	W	W	W	W
Combined value of cement, gypsum, iron, oxide pigments (crude 1989), lead (1988-89), molybdenum, perlite, pyrites, salt, tin (1988-89), and values indicated by symbol W ------	XX	r/333,474	XX	224,884
Total ----------	**XX**	**3,159,295**	**XX**	**3,060,218**

/e Estimated; /p Preliminary; NA Not available; W Withheld to avoid disclosing company proprietary data, value included with "Combined value" figure; XX not applicable;
(1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers)
(2 Recoverable content of ores, etc.
Source: "The Mineral Industry of Arizona in 1989" Mineral Industry Surveys, U.S. Bureau of Mines

TITLE XI
ESTIMATED
COPPER MINE CAPACITY IN ARIZONA (1

(Short Tons Of Recoverable Copper/Year)

OPERATOR	MINE	CAPACITY	
Phelps Dodge	Morenci/Metcalf	337,000	(a
Cyprus	Sierrita/Twin Buttes	138,000	(a
Magma	San Manuel	133,000	(a
Asarco	Ray	115,000	(a
Cyprus	Bagdad	108,000	(a
Magma	Pinto Valley	88,000	(a
Asarco	Mission/San Xavier	80,000	(a
Cyprus	Inspiration Area	61,000	(a
Phelps Dodge	New Cornelia	40,000	(d
Magma	Superior	20,000	(c
Cyprus	Mineral Park	17,000	(d
Magma	Miami & Miami Tails	9,000	(a (b
Cyprus	Christmas	8,000	(d
SAV	Oracle Ridge	6,000	(b
Arimetco	Johnson	5,000	(b
Asarco	Silver Bell	4,000	(e
Cyprus	Casa Grande	2,000	(e
Phelps Dodge	Copper Queen	2,000	(e
TOTAL		**1,173,000**	

(1 Figures generally represent a current estimate of the productive capacity of primary recoverable copper in concentrates, precipitates, and cathodes. Figures do not represent smelter or refinery capacity. The estimates are based on recent production figures and on capacities of concentrator and leach plant facilities. Other factors affecting actual production include, for example, grade of ore and recovery. Some capacities have been published by the reporting company. Capacities for shut down operations are historic and not necessarily immediately available.

(2 Basis of capacity estimate
- *(a Recent production figures*
- *(b Design capacity & ore grade*
- *(c Company annual report or 10K*
- *(d Historic data*
- *(e Leaching only*

Source: Arizona Department of Mines & Mineral Resources file data; Company Annual Reports and Form 10K; Professional Publications.

TABLE XII

COPPER SMELTERS

End of 1990 - Short Tons

Company	Location Of Plant	Annual Capacity
	NORTH AMERICA	
UNITED STATES		
ASARCO Incorporated		
El Paso Smelter	El Paso, TX	450,000
Hayden Smelter	Hayden, AZ	720,000
Hayden-Ray Smelter	Hayden, AZ	360,000
Chemetco Inc.	Alton, IL	150,000
Copper Range Company	White Pine, MI	70,000
Cyprus Miami Mining Corporation	Claypool, AZ	408,000
Kennecott Corporation		
Kennecott Utah Copper	Garfield, UT	820,000
Magma Copper Company		
San Manuel Refining Division	San Manuel, AZ	1,026,000
Phelps Dodge Corporation		
Chino Mines	Hurley, NM	550,000
Tyrone Branch	Playas, NM	750,000
Total (a)		5,304,000
CANADA		
Falconbridge Ltd.	Falconbridge, Ont.	700,000
Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon, Manitoba	340,000
Inco Ltd.	Copper Cliff, Ont.	1,800,000
Noranda Mines Inc.		
Gaspe Smelter	Murdochville, Que.	357,000
Horne Smelter	Rouyn-Noranda, Que.	1,000,000
Total (a)		4,554,000
MEXICO		
Compania Minera De Cananea, S.A.	Cananea, Son.	277,000
Industrial Minera Mexico, S.A.	San Luis Potosi	42,000
Mexicana De Cobre, S.A. De C.V.	Nacozari, Sonora	672,000
Total (a)		1,091,000

Source: American Bureau of Metal Statistics Inc.
The capacity of copper smelting works is given as estimated by the respective proprietors.
(a) Tons of material.

TABLE XIII
COPPER PRODUCTION BY COMPANIES (g)
Short Tons

	1986	1987	1988	1989	1990
			United States		
ASARCO Incorporated	98,200	194,800	206,000	235,700	266,400
Cominco American Incorporated					
And Dresser Minerals (e	1,892	1,925	1,671	1,489	1,586
Copper Range Company (f	31,298	53,053	45,802	52,061	51,104
Cyprus Copper Corporation	145,445	173,537	233,242	293,451	312,102
The Doe Run Company	--	13,018	22,936	20,220	13,261
Hecla Mining Company (a	346	289	481	460	250
Apex Mine	n.a.	n.a.	n.a.	n.a.	45
Coeur Mine (j	62	58	47	50	43
Galena Mine (k	141	121	125	129	113
Lucky Friday Mine	143	110	309	281	49
Inspiration Consolidated					
Copper Company (f	32,085	35,582	(d)	(d)	(d)
Kennecott Corporation (l	190,000	60,000	245,000	244,000	251,000
Magma Copper Company (m	210,057	197,013	200,753	214,388	232,458
Pinto Valley Division	97,544	75,550	78,550	91,781	96,837
San Manuel Mining Division	112,513	121,463	122,203	122,607	132,818
Superior Mining Division	-	-	-	-	2,803
Montana Resources	8,876	30,856	53,155	39,634	37,245
Noranda Lakeshore Mines Inc. (b	3,581	1,152	--	--	--
Phelps Dodge Corporation					
(U.S. mines) (b	405,400	468,900	494,500	500,500	548,400
Tennessee Chemical Company	7,475	4,560	--	--	. --
Refiners (c					
ASARCO Incorporated	441,600	447,700	484,700	492,800	482,400

Source: American Bureau of Metal Statistics Inc.

(a Includes Hecla's share of production from each mining property.

(b Includes copper produced from purchased ores.

(c The totals for these concerns are to a large extent duplications of the reports of other producers.

(d Starting in 1988, Cyprus Miami Mining Corp.

(e Magmont mine.

(f Refined production.

(g Copper content of mine production unless otherwise noted.

(h Mine abandoned in 1979.

(i Mine abandoned in 1981.

(j Operated by ASARCO - Shows Hecla Mines share of 5%.

(k Operated by ASARCO - Shows Hecla Mines share of 25%.

(l Reported production of refined copper plus unrefined copper sales. Includes only Kennecott's share from jointly owned properties.

(n Refined copper contained in concentrates produced & SX-EW production.

TABLE XIV

COPPER IMPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1986	1987	1988	1989	1990
Ores, Concentrates, Mattes & Cement	**5,977**	**12,765**	**9,101**	**52,264**	**159,762**
Canada	2,147	4,093	178	--	--
Mexico	--	6,753	6,822	47,581	142,236
Argentina	18	--	--	--	--
Bolivia	--	7	--	--	--
Chile	71	--	34	3,931	--
Peru	1,431	1,474	55	--	66
Ireland	--	--	1	--	--
Monaco	--	--	--	76	--
Portugal	--	--	--	--	17,460
Sweden	--	--	--	661	--
United Kingdom	--	--	--	3	--
Japan	639	--	--	--	--
Mozambique	--	--	--	12	--
Australia	1,671	438	2	--	--
Papua New Guinea	--	--	2,009	--	--
Blister & Anodes	**51,049**	**47,991**	**108,505**	**85,117**	**48,806**
Canada	3,248	15	--	207	2
Mexico	20,068	15,457	1,145	7,325	17,271
Chile	27,409	21,532	53,206	37,982	15,389
Peru	--	2,921	3,282	3,254	3,948
Germany	269	95	--	--	38
Switzerland	--	--	2	--	--
Japan	--	2,189	32,150	24,580	3,854
Cote D'Ivoire	--	--	5,647	--	--
Nambia	--	--	--	--	141
South Africa	--	5,782	9,815	--	--
Tanzania	--	--	--	1,088	--
Zaire	--	--	3,258	10,681	8,163
Zambia	55	--	--	--	--
Refined Cathodes & Shapes	**541,990**	**556,973**	**367,150**	**334,884**	**288,441**
Canada	219,969	231,078	195,996	199,312	203,171
Mexico	1,419	611	46	181	81
Brazil	--	--	1,319	20,085	11,247
Chile	164,436	159,915	91,211	87,226	62,334
Peru	59,035	46,716	14,848	10,186	2,672
Venezuela	--	--	137	--	110
Austria	--	--	495	21	10

continued

TABLE XIV

COPPER IMPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1986	1987	1988	1989	1990
Refined Cathodes & Shapes Cont.					
Belgium	2,386	702	1,396	--	--
Finland	--	--	441	--	--
Germany	--	34,680	5,573	310	170
Netherlands	--	7,043	5,567	2,680	--
Norway	--	205	390	61	761
Poland	--	--	714	--	--
Portugal	--	--	--	--	1,091
Spain	--	--	3,530	--	242
Sweden	--	16,788	4,157	--	1,104
Switzerland	--	--	385	--	287
United Kingdom	6,381	--	--	21	--
Yugoslavia	--	4,629	2,199	--	--
China	--	165	845	71	153
Hong Kong	--	--	711	--	--
Japan	--	661	--	3	--
Syria	--	--	--	--	20
Taiwan	--	300	--	--	--
Congo	3,155	--	--	--	--
Niger	--	--	--	912	--
South Africa	11,101	5,046	1,985	1,193	830
Zaire	39,688	26,446	35,143	12,607	3,469
Zambia	32,714	21,834	--	--	689
Other Countries	1,706	154	62	15	--
Copper Waste & Scrap	**30,001**	**36,510**	**40,952**	**34,808**	**39,579**
Canada	22,529	28,302	28,860	21,350	25,723
Bahamas	249	23	37	17	22
Barbados	86	67	72	56	80
Costa Rica	127	214	224	594	582
Dominican Republic	265	592	648	515	450
El Salvador	--	167	--	--	106
Guatemala	20	94	205	267	491
Haiti	--	--	--	49	41
Honduras	37	41	53	38	57
Jamaica	128	62	194	207	363
Mexico	5,692	5,890	8,036	3,933	4,013
Netherlands Antilles	--	94	139	31	109
Panama	378	431	977	703	655
St. Vincent	--	--	--	14	33

continued

TABLE XIV

COPPER IMPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper Waste & Scrap Continued					
Trinidad	18	93	209	336	151
Brazil	--	--	--	--	194
Chile	--	--	79	5,296	4,024
Peru	--	55	--	--	--
Suriname	--	--	48	--	15
Venezuela	1	--	628	648	1,661
France	40	24	119	--	11
Germany	63	--	111	325	--
Italy	--	62	--	--	--
Netherlands	--	--	--	304	466
United Kingdom	--	24	42	1	58
Japan	--	--	--	--	79
Korea, South	112	124	48	7	28
Malaysia	--	30	--	--	61
Singapore	--	79	--	--	--
Taiwan	--	25	27	--	--
Ghana	--	--	--	--	23
Other Countries	256	17	196	117	83
Copper Alloy Waste & Scrap(a	**43,008**	**48,703**	**55,146**	**87,435**	**108,809**
Canada	28,303	32,661	31,120	42,720	69,333
Bahamas	46	37	--	67	--
Barbados	--	41	--	35	--
Costa Rica	14	40	--	146	168
Dominican Republic	328	464	962	1,177	1,174
Guatemala	17	82	137	346	290
Haiti	--	--	142	118	189
Honduras	20	2	107	68	--
Jamaica	140	136	204	353	595
Mexico	11,917	11,570	14,180	22,825	24,542
Netherlands Antilles	--	257	249	340	560
Panama	731	784	739	935	735
St. Vincent	--	--	--	58	--
Trinidad	41	155	306	332	261
Chile	78	116	1,992	3,690	214
Columbia	--	--	--	--	2,665
Guyana	--	--	--	18	365
Peru	--	629	144	--	--
Venezuela	--	208	1,040	6,772	4,915

continued

TABLE XIV

COPPER IMPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper Alloy Waste & Scrap Continued					
Belgium	14	43	1,675	1,577	--
Finland	--	--	--	--	177
France	21	24	--	206	212
Germany	147	303	251	234	230
Italy	--	163	--	21	--
Netherlands	--	41	--	--	--
Portugal	--	--	--	33	--
Sweden	78	78	--	21	--
Switzerland	--	51	--	47	--
United Kingdom	106	321	290	302	138
China	--	--	82	150	--
Hong Kong	--	--	145	102	21
Japan	--	57	210	336	212
Korea, South	325	153	--	95	78
Malaysia	112	54	--	47	267
Philippines	69	--	--	15	--
Singapore	--	114	--	195	153
Taiwan	--	36	358	3,835	202
Marshall Islands	--	--	--	--	163
Other Countries	501	83	813	219	950
Master Alloys	**683**	**814**	**889**	**743**	**1,017**
Unwrought Alloys	**17,815**	**15,812**	**11,547**	**4,487**	**1,506**
Copper And Copper Alloy Imports Of Brass Mill Products (b)					
Strip, Sheet & Plate					
Copper	43,985	33,997	37,167	37,859	39,266
Copper Alloy	142,311	114,376	99,981	81,235	70,763
Foil					
Copper	32,653	46,708	44,945	33,957	43,190
Copper Alloy	29,615	29,912	22,677	27,216	26,311

continued

TABLE XIV

COPPER IMPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper And Copper Alloy Imports Of Brass Mill Products (b) Continued					
Wire					
Copper Alloy	22,585	23,833	25,028	22,143	22,353
Rod, Bar & Other					
Copper	38,970	31,391	31,474	29,617	31,155
Copper Alloy	55,756	64,579	74,634	75,622	61,137
Tube & Pipe					
Copper	84,963	100,021	91,924	72,896	46,565
Copper Alloy	61,857	57,224	59,493	66,882	57,430
Copper Wire Insulated (c	**95,201**	**103,597**	**106,022**	**n.a.**	**n.a.**

Source: American Bureau of Metal Statistics, Inc., U.S. Bureau of the Census. Current monthly data available, report 010, for the above table on an annual subscription basis.

(a) Copper alloy content. (b) Thousands of pounds. (c) Gross weight. n.a.-Not available at time of publication.

TABLE XV
COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES
Copper Content-Short Tons

	1986	1987	1988	1989	1990
Ores, Concentrates, Mattes & Cement	**192,183**	**137,512**	**239,438**	**304,288**	**287,597**
Canada	6,993	2,013	9,367	15,212	20,604
Mexico	--	4	2,151	921	1,482
Brazil	--	--	--	18,335	15,675
Belgium	--	--	--	265	4
Bulgaria	--	--	--	5,026	--
Finland	5,096	7,968	1,967	7,982	4,461
France	--	--	--	110	33
Germany	--	976	45,808	15,419	153
Italy	--	--	--	--	165
Spain	--	--	--	15	104
United Kingdom	--	--	--	555	575
Yugoslavia	--	4,113	--	6,211	--
China	13,771	2,723	10,316	4,028	19,539
Hong Kong	--	--	--	4	12,233
India	--	--	--	35	--
Indonesia	--	--	--	136	--
Israel	--	--	--	4	38
Japan	145,103	109,737	149,762	178,088	188,280
Korea, South	15,548	5,681	13,225	37,734	20,744
Malaysia	--	--	--	170	95
Philippines	--	--	3,511	4,117	3,089
Taiwan	5,505	4,162	3,291	9,605	64
Australia	--	--	--	251	185
Other Countries	167	135	40	65	74
Blister & Anodes	**17,598**	**13,600**	**36,023**	**6,083**	**7,077**
Canada	437	922	10,818	3,494	3,842
Mexico	--	303	584	139	218
Chile	--	--	--	472	--
Germany	--	--	5,241	42	21
Italy	--	--	--	5	52
Spain	100	5	1,164	--	59
United Kingdom	--	--	--	43	--
Hong Kong	185	784	740	627	759
India	--	--	--	--	42
Japan	776	4,706	--	180	885
Korea, South	14,879	5,122	16,279	30	81
Saudi Arabia	--	--	--	114	--
Singapore	94	112	217	122	127
Taiwan	636	521	588	606	893
Thailand	--	--	--	46	--

(continued next page)

TABLE XV
COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES
Copper Content-Short Tons

	1986	1987	1988	1989	1990
Blister & Anodes (continued)					
Egypt	--	--	--	32	--
Ghana	--	--	--	39	66
Other Countries	491	1,125	212	92	32
Refined Cathodes & Shapes	**16,446**	**20,304**	**64,574**	**147,106**	**232,769**
Canada	5,357	4,943	4,238	5,215	2,236
Costa Rica	--	--	--	436	866
Dominican Republic	--	46	--	93	8
El Salvador	--	--	--	108	129
Honduras	--	--	--	291	75
Mexico	317	4,674	9,409	8,097	6,214
Brazil	126	501	56	19	80
Chile	--	--	--	70	--
Venezuela	149	134	--	1,429	5,216
Belgium	--	391	234	21	2,442
France	516	535	1,660	760	1,567
Germany	1,533	514	1,456	1,430	1,068
Italy	--	218	4,984	652	748
Netherlands	305	276	9,583	731	3,714
Switzerland	108	49	137	249	115
United Kingdom	2,469	1,185	2,729	1,197	1,090
China	--	--	3,905	15,727	3,911
Hong Kong	661	458	592	644	1,580
India	--	--	--	--	57
Indonesia	--	--	--	--	2,088
Israel	--	--	--	77	34
Japan	--	3,036	14,877	53,374	113,720
Korea, South	1,473	2,063	6,755	1,374	8,668
Malaysia	--	--	512	--	2
Philippines	--	--	106	2	21
Singapore	--	2	1,410	1,328	1,580
Taiwan	2,835	1,178	1,776	53,729	
Thailand	--	--	--	--	2,376
Egypt	--	--	--	--	168
Other Countries	597	101	155	53	66
Copper Waste & Scrap	**150,375**	**119,776**	**132,025**	**170,789**	**153,907**
Canada	15,149	12,273	32,159	41,956	55,651
Mexico	6,488	13,533	12,672	8,639	9,789
Brazil	4,374	3,326	655	892	846
Chile	--	--	--	140	--

(continued next page)

TABLE XV
COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES
Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper Waste & Scrap (continued)					
Venezuela	--	217	337	20	39
Belgium	3,552	2,154	3,100	3,991	403
Finland	--	97	--	--	--
France	--	--	--	59	436
Germany	9,385	4,774	10,748	14,570	6,294
Italy	13,585	6,769	920	280	1,080
Netherlands	1,887	406	1,019	3,779	793
Norway	--	--	118	245	289
Portugal	--	--	--	50	32
Spain	6,191	8,877	3,725	958	168
Switzerland	--	--	17	122	--
United Kingdom	1,637	822	2,547	1,354	969
China	--	210	470	6,666	8,592
Hong Kong	6,312	3,656	1,579	1,242	1,003
India	792	545	2,222	1,203	434
Indonesia	--	--	--	456	39
Japan	13,835	17,141	17,780	22,411	19,622
Korea, South	13,632	10,650	21,540	35,936	35,584
Philippines	--	1,045	--	133	44
Singapore	754	1,262	2,313	134	64
Taiwan	51,694	31,791	17,959	26,503	11,658
Australia	--	157	--	--	44
Other Countries	1,108	71	145	50	34
Copper Alloy Waste & Scrap (a)	**167,121**	**204,335**	**220,405**	**234,284**	**203,677**
Canada	22,628	23,321	26,023	33,069	11,073
Mexico	935	6,308	11,127	16,322	13,180
Trinidad	--	776	1,053	164	795
Brazil	4,363	7,037	649	1,964	251
Venezuela	--	141	165	99	17
Austria	--	310	--	--	15
Belgium	6,187	8,019	9,607	6,466	6,820
France	--	106	770	837	644
Germany	5,325	8,513	23,133	44,054	15,353
Greece	--	--	--	25	126
Italy	21,608	7,177	2,148	5,458	12,966
Netherlands	1,644	885	1,229	3,347	4,821
Portugal	--	--	--	84	--
Spain	8,595	6,911	11,132	4,589	877
Sweden	2,587	1,763	1,780	2,319	3,605
Switzerland	--	180	59	9	3

(continued next page)

TABLE XV
COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES
Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper Alloy Waste & Scrap (a) continued					
United Kingdom	4,486	2,975	2,974	6,023	2,504
China	--	198	1,146	9,377	16,267
Hong Kong	--	576	227	1,581	3,693
India	18,254	13,079	14,533	28,169	36,232
Japan	28,317	26,522	18,988	20,558	31,667
Korea, South	15,837	28,761	48,550	32,151	28,896
Pakistan	--	--	--	37	57
Philippines	--	126	--	92	92
Singapore	--	255	1,254	1,339	2,557
Taiwan	24,153	60,326	43,647	15,732	9,641
Thailand	--	--	--	118	145
South Africa	--	--	--	98	712
Australia	--	--	--	38	347
New Zealand	--	--	--	--	78
Other Countries	2,202	70	211	165	243
Master Alloys	**851**	**1,127**	**1,034**	**631**	**762**
Unwrought Alloys	**2,714**	**9,648**	**8,695**	**6,651**	**9,459**
Copper And Copper Alloy Exports of Brass Mill Products (b)					
Strip, Sheet & Plate					
Copper	1,414	1,195	1,903	7,504	15,550
Copper Alloy	11,375	16,809	34,526	18,526	32,193
Foil (c)					
Copper & Copper Alloy	662	1,125	5,704	3,694	6,318
Copper	n.a.	n.a.	n.a.	1,069	1,592
Copper Alloy	n.a.	n.a.	n.a.	2,625	4,726
Wire					
Copper Alloy	11,127	14,556	16,725	8,592	14,454
Rod, Bar & Other					
Copper	2,030	8,204	5,183	34,603	27,846
Copper Alloy	14,879	16,703	24,480	50,430	54,171
Tube & Pipe					
Copper Alloy	11,781	14,218	17,078	44,702	35,270
Copper Alloy	9,651	12,917	20,618	9,436	11,163

(continued next page)

TABLE XV
COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES
Copper Content-Short Tons

	1986	1987	1988	1989	1990
Copper And Copper Alloy Exports Of Brass Mill Products (b) (continued)					
Wire & Cable, Bare	7,915	11,237	13,692	n.a.	n.a.
Insulated Wire & Cable (d)	65,217	95,211	128,633	n.a.	n.a.
Copper Exports Of Copper Imports Of The United States (e)					
Blister & Anodes	4	--	10	--	2
Refined Cathodes & Shapes	692	11	2,261	13,291	1,714
Copper Waste & Scrap	300	218	523	286	431
Copper Alloy Waste & Scrap (a)	12,531	8,772	609	2,184	1,054

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census.
Current monthly data available, report 011, for the above table on an annual subscription basis.
(a) Copper alloy content. (b) Thousands of pounds. (c) 1988 data combines copper and copper alloys as well as not backed and backed. 1989 separates copper alloys and includes only not backed. (d) Gross weight. (e) Copper content.
n.a. - not available at time of publication.

TABLE XVI

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1948	11,493	41,318,524	3,595	69.13	39,072,204
1949	11,001	40,612,224	3,692	71.00	37,365,611
1950	10,181	41,994,321	4,125	79.33	41,757,273
1951	10,754	47,825,698	4,447	85.52	42,784,388
1952	11,365	54,950,235	4,835	93.14	44,472,522
1953	12,068	62,742,982	5,199	99.98	45,187,838
1954	12,502	65,518,853	5,241	100.79	43,072,894
1955	12,399	71,293,263	5,750	110.58	52,189,728
1956	14,008	83,568,996	5,966	114.73	60,468,580
1957	14,652	85,125,320	5,809	111.71	59,571,834
1958	14,100	74,726,972	5,300	101.93	56,255,809
1959	11,568	72,095,130	6,232	119.85	53,121,545
1960	13,764	90,312,848	6,562	126.19	66,032,439
1961	14,275	97,271,286	6,814	131.04	71,918,991
1962	14,408	101,920,108	7,074	136.04	78,868,147
1963	14,303	104,291,588	7,292	140.23	80,615,132
1964	14,720	113,792,031	7,730	148.65	86,132,039

(continued)

TABLE XVI

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1965	15,239	122,163,124	8,016	154.16	92,859,535
1966	17,018	137,187,611	8,061	155.02	101,558,298
1967	13,426	108,427,206	8,076	155.31	74,289,203
1968	15,734	136,089,579	8,649	166.33	101,293,963
1969	19,459	173,183,018	8,900	171.15	127,848,828
1970	21,479	201,665,064	9,389	180.56	150,241,000
1971	21,231	211,978,597	9,984	192.00	149,294,000
1972	23,233	254,717,341	10,964	210.85	165,914,825
1973	25,494	291,294,328	11,426	218.89	181,311,945
1974	27,894	340,832,096	12,219	234.98	178,913,296
1975	25,950	363,349,178	14,002	269.27	168,750,152
1976	25,631	405,289,034	15,812	304.08	194,136,559
1977	23,373	398,539,789	16,835	323.75	168,641,401
1978	21,092	397,790,419	18,860	362.69	178,204,491
1979	23,239	494,963,476	21,299	409.60	203,997,408
1980	21,602	510,168,454	23,617	454.17	169,650,401
1981	26,031	687,434,789	26,408	507.85	216,787,430
1982	17,182	487,415,292	28,368	545.53	135,768,647

(continued)

TABLE XVI
"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1983	13,864	395,266,852	28,510	548.29	135,301,652
1984	12,556	387,028,537	30,824	592.77	145,278,431
1985	11,155	349,311,047	31,314	602.19	174,218,218
1986	10,848	326,915,975	30,136	579.54	167,808,000
1987	10,340	299,297,407	28,946	556.65	166,113,000
1988	10,588	348,502,604	33,008	634.78	175,261,000
1989	11,111	383,199,684	34,488	663.23	196,684,000
1990	11,352	411,433,093	36,243	696.99	213,168,000

(1 "Covered Employment" by law includes all employees of employers of three or more persons. Prior to 1966 only a portion of the workers in smelting, refining and rod fabrication were included in this table.

Source: This report, Table XVII; "Mineral Yearbook - Area Reports: Domestic," U.S. Bureau of Mines; Research and Statistics Unit, Arizona Department of Economic Security.

TABLE XVII

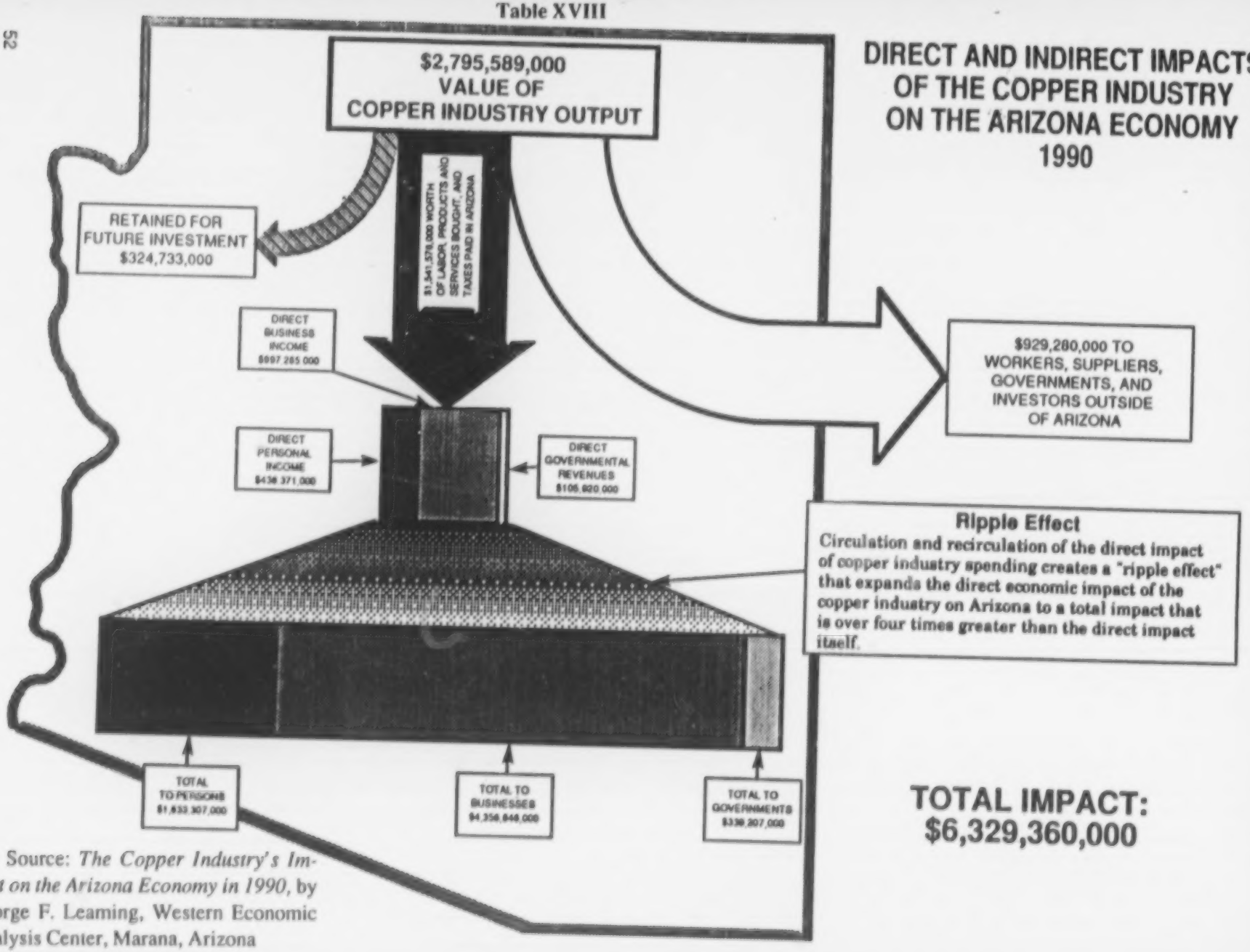
ARIZONA INDUSTRIES COVERED BY UNEMPLOYMENT INSURANCE
YEAR 1990

Industry	Average Number of Employees	Total Wages	Average Annual Wage	Average Weekly Wage
Copper Mining	10,006	390,153,906	35,994	692.19
Copper Smelting, Refining & Rod Fabrication	1,346	51,279,187	38,097	732.64
TOTAL COPPER MINING & PROCESSING	**11,352**	**411,433,093**	**36,243**	**696.99**
Other Mining, Quarrying & Processing	1,316	54,948,921	41,754	802.97
ALL MINING, QUARRYING & PROCESSING	**12,668**	**466,382,014**	**36,816**	**708.00**
Mfg. Except Copper Processing	170,535	5,363,925,885	31,454	604.88
Construction	86,594	1,828,338,184	22,136	425.70
Transportation, Utilities, etc. (2	73,780	2,053,215,492	27,829	535.17
Wholesale-Retail Trade	370,837	5,683,089,063	15,325	294.71
Services, Finance & Misc.	487,593	10,145,842,453	20,808	400.15
Agriculture & Related Services	23,611	297,481,977	12,599	242.29
Federal, State & Local Government	258,516	6,225,276,463	24,081	463.09
TOTAL AND AVERAGES	**1,465,226**	**30,506,179,984**	**20,820**	**400.39**

(1 Includes all covered employees.
(2 Transportation exclusive of railroads.

Source: Research Administration, Arizona Department of Economic Security

Table XVIII



Source: *The Copper Industry's Impact on the Arizona Economy in 1990*, by George F. Leaming, Western Economic Analysis Center, Marana, Arizona

TABLE XIX
EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING IN THE UNITED STATES AND ARIZONA (1

	ALL EMPLOYEES		PRODUCTION WORKERS											
	Average No. (Thousands)		Average No. (Thousands)		Average Weekly Earnings		Average Weekly Hours		Average Hourly Earnings		Average Earnings Per Man Per Year		Aggregate Man Hours (Thousands)	
Period	(2 Ariz.	U.S.	(4 Ariz.	U.S.	(5 Ariz.	U.S.	Ariz.	U.S.	(6 Ariz.	U.S.	(7 Ariz.	U.S.	(8 Ariz.	U.S.
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93	8,997	9,135	33,936	68,570
1971	18.9	34.7	14.9	26.8	178.50	178.46	42.4	42.9	4.21	4.16	9,282	9,280	32,852	59,785
1972	20.5	38.9	16.1	30.7	194.69	192.19	41.6	41.6	4.68	4.62	10,124	9,994	34,827	66,410
1973	21.5	42.3	17.6	33.7	206.75	206.42	41.6	42.3	4.97	4.88	10,751	10,734	38,072	74,127
1974	24.0	42.8	19.1	33.8	222.16	226.46	39.6	41.1	5.61	5.51	11,552	11,776	39,331	72,237
1975	22.5	37.1	17.9	28.4	247.43	247.14	38.6	39.2	6.41	6.33	12,866	12,903	35,929	57,891
1976	21.7	35.5	17.2	27.0	286.31	280.70	40.1	40.1	7.14	7.00	14,888	14,596	35,865	56,300
1977	19.3	35.1	15.3	26.9	302.99	288.73	39.4	38.6	7.69	7.48	15,755	15,014	31,347	53,994
1978	17.2	35.2	13.7	26.9	344.76	338.40	40.8	40.0	8.45	8.46	17,928	17,597	29,066	55,952
1979	19.3	31.9	15.3	24.6	404.81	405.03	42.3	42.5	9.57	9.53	21,050	21,061	33,654	54,366
1980	17.7	29.4	14.0	22.6	446.19	435.01	41.7	41.0	10.70	10.61	23,202	22,621	30,358	48,183
1981	21.9	36.2	17.4	27.9	497.28	492.54	41.2	41.6	12.07	11.84	25,859	25,612	37,278	60,353
1982	15.2	25.3	12.1	18.5	495.60	48[illegible].91	38.3	38.7	12.94	12.53	25,771	25,215	24,098	37,229
1983	11.3	18.9	9.0	13.5	519.25	52[illegible].69	39.1	39.9	13.28	13.10	27,001	27,180	18,299	28,010
1984	10.5	16.3	8.2	11.4	553.83	562.74	41.3	41.5	13.41	13.56	28,799	29,002	17,610	24,601
1985	9.4	13.1	7.5	9.4	573.80	574.76	41.4	42.2	13.86	13.62	29,838	29,888	16,146	20,627
1986	8.7	11.4	6.9	8.8	582.38	507.99	40.4	41.3	14.42	12.30	30,284	26,415	14,496	18,899
1987	8.6	13.5	6.9	10.7	556.65	492.20	40.1	43.1	13.88	11.42	28,946	25,595	14,388	23,981
1988	8.8	14.4	7.0	11.2	517.74	510.12	41.3	43.9	12.53	11.62	26,932	26,526	15,033	25,567
1989	9.5	14.1	7.5	11.2	561.26	540.44	43.4	45.8	12.94	11.80	29,186	28,103	16,926	26,674
1990	10.0	15.1	7.9	12.3	599.84	569.09	43.7	45.6	13.72	12.48	31,177	29,593	17,952	29,166

Continued

TABLE XIX
(Cont'd)
EMPLOYMENT, EARNINGS, AND HOURS IN COPPER MINING IN THE UNITED STATES AND ARIZONA (1

	Copper Ore Mined (Thousand Short Tons)		Copper Produced (Recoverable Content) (Thousand Pounds)		Worker Productivity			
					Copper Ore Mined Per Man Hour (Tons)		Copper Produced Per Man Hour (Pounds)	
Period	Arizona	U.S.	Arizona	U.S.	Arizona	U.S.	Arizona	U.S.
1970	150,241	257,729	1,826,734	3,368,957	4.427	3.759	53.829	49.132
1971	149,294	242,656	1,633,568	2,986,599	4.544	4.059	49.725	49.996
1972	165,815	266,831	1,816,118	3,264,113	4.761	4.017	52.161	49.151
1973	173,605	289,998	1,847,635	3,386,357	4.872	3.912	48.530	45.683
1974	178,821	293,443	1,710,744	3,145,148	4.547	4.062	43.496	43.539
1975	168,656	263,003	1,619,535	2,772,111	4.694	4.543	45.076	47.885
1976	194,046	283,736	2,043,168	3,166,889	5.410	5.040	56.968	56.250
1977	168,601	259,974	1,843,949	2,964,539	5.379	4.815	58.824	54.905
1978	178,201	263,722	1,965,072	2,955,210	6.131	4.713	67.607	52.817
1979	203,977	291,078	2,085,556	3,140,110	6.061	5.369	61.971	57.759
1980	169,650	241,090	1,669,495	2,527,920	5.588	5.004	54.994	52.465
1981	216,787	306,089	2,294,437	3,354,548	5.815	5.072	61.549	55.582
1982	146,125	200,589	1,697,500	2,507,070	6.064	5.388	70.442	67.342
1983	152,902	196,203	1,514,538	2,288,612	8.356	7.005	82.766	81.707
1984	145,278	189,499	1,583,505	2,405,866	8.250	7.703	89.921	97.795
1985	174,218	239,399	1,778,334	2,443,675	10.790	11.606	110.141	118.470
1986	167,808	186,105	1,752,525	2,361,127	11.576	9.847	120.897	124.934
1987	166,113	219,545	1,724,068	2,810,182	11.545	9.155	119.827	117.189
1988	175,261	246,380	1,885,112	3,168,229	11.658	9.637	125.398	123.918
1989	196,684	261,534	2,009,782	3,303,002	11.620	9.805	118.739	123.828
1990	213,168	275,024	2,174,574	3,477,904	11.874	9.430	121.133	119.245

Continued

TABLE XIX
(Cont'd)
EMPLOYMENT, EARNINGS, AND HOURS IN COPPER MINING IN THE UNITED STATES AND ARIZONA (1

(1 Statistics do not reflect workers in copper smelting, refining and rod fabrication.

(2 These figures are estimates made by the Arizona Department of Economic Security, in cooperation with the U.S. Bureau of Labor Statistics, and they include all full-time and part-time wage and salary workers who are employed in copper mining in any part of the pay period which included the 12th of each month of the year.

(3 Estimates made by the U.S. Bureau of Labor Statistics, in cooperation with the 50 states, and based upon monthly samplings similar to those in (2 above, adjusted periodically to census bench mark.

(4 Estimates of production (non-supervisory) workers based upon samplings as in (2 above. Since 1975, figures have been calculated by the Arizona Department of Mines and Mineral Resources dividing the annual number of "All Employees in Arizona" by a factor of 1.26. This factor was derived by comparing the annual number of "All Employees-Arizona" with "Production Workers - Arizona" from 1970 to 1974.

(5 Earnings figures for a particular year is the product of "Average Hourly Earnings" and "Average Weekly Hours" for that year.

(6 Gross payroll aggregates, exclusive of irregular bonuses and other pay not earned in a sample pay period, are divided by gross man-hour aggregates of production and related workers for the period in order to determine average hourly earnings.

(7 "Average Weekly Earnings" times 52 weeks.

(8 Number of production workers times "Average Weekly Hours" times 52 weeks.

Source: Table I this publication, American Bureau of Metal Statistics Unit, Arizona Department of Economic Security, Mineral Yearbook - Metals, Minerals," U.S. Bureau of Mines. "Employment and Earnings," U.S. Dept. of Labor, *Bureau of Labor Statistics, March issues, U.S. Dept. of Interior.*

Figure 3. COPPER PRODUCED (RECOVERABLE CONTENT IN THOUSAND POUNDS)*

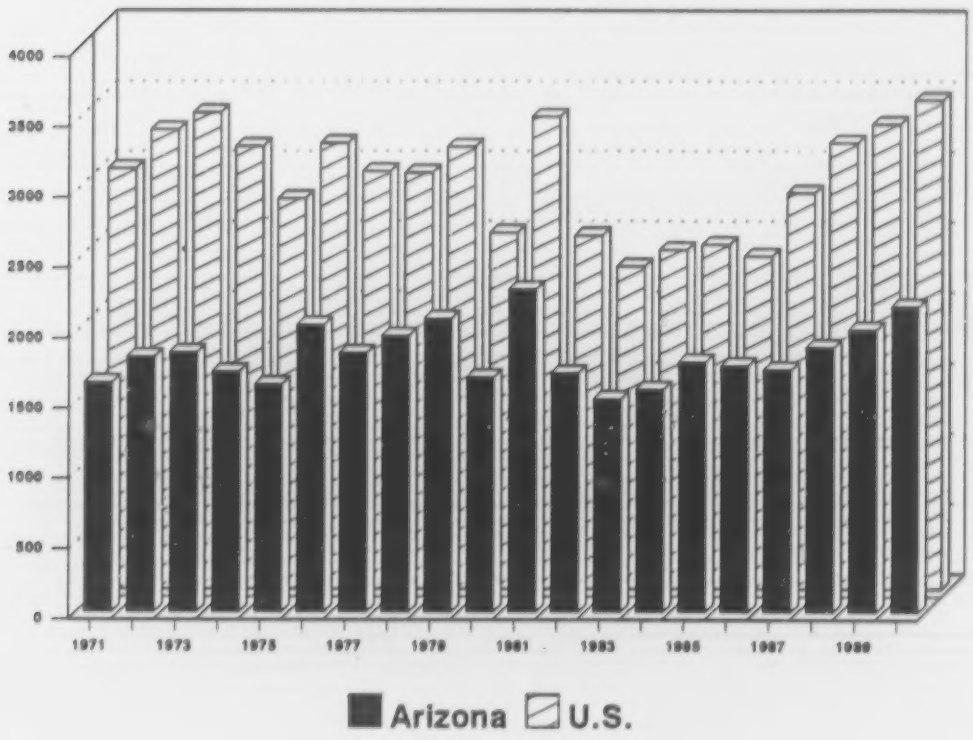
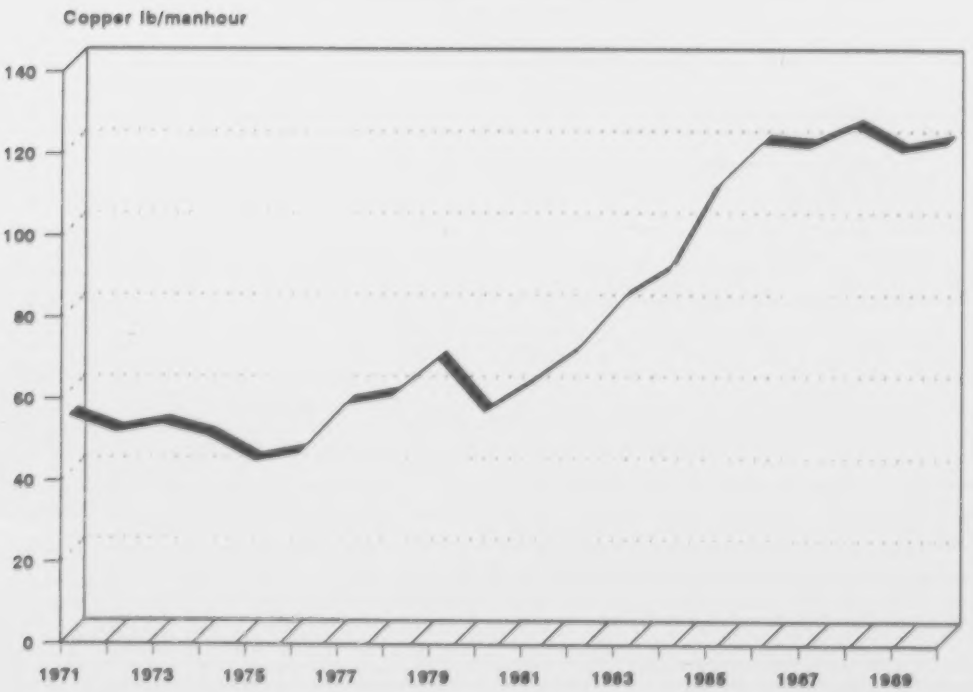


Figure 4. PRODUCTIVITY OF ARIZONA COPPER WORKERS *



* From Table XIX

TABLE XX
REFINED COPPER INVENTORIES AT YEAR END
AMOUNTS IN THOUSANDS OF SHORT TONS

Location	1985	1986	1987	1988	1989	1990*
U.S. Refineries	150.4	145.1	63.1	42.9	56.4	40.0
Comex Warehouses	120.3	93.3	18.3	13.4	16.3	17.0
Total U.S.	**270.7**	**238.4**	**81.4**	**56.3**	**72.7**	**57.0**
Refineries Elsewhere	293.7	280.6	202.6	265.0	243.3	275.0
LME Warehouses	209.1	193.1	58.3	72.5	119.0	191.0
Total Elsewhere	**502.8**	**473.7**	**260.9**	**327.4**	**362.3**	**466.0**
Aggregate Inventories	**773.5**	**712.1**	**342.3**	**383.7**	**435.0**	**523.0**

* *Estimate*

Source: American Bureau of Metal Statistics as reported in E&MJ. All figures for December 31, 1988.

TABLE XXI
AVERAGE QUOTED PRICE OF
ELECTROLYTIC COPPER WIREBAR
DOMESTIC DELIVERED

U.S.¢/lb (1

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
January	88.570	78.634	80.219	68.792	64.487	69.881	64.986	132.496	152.770	108.644
February	86.071	78.779	84.024	70.748	66.446	68.253	65.525	105.025	140.211	111.260
March	87.382	75.862	82.072	75.311	65.547	70.144	68.071	109.720	148.492	128.414
April	88.033	76.273	83.493	77.388	70.318	68.801	67.129	103.641	143.486	126.936
May	85.798	77.948	85.634	72.229	69.864	67.082	70.985	104.373	127.146	124.574
June	85.226	71.488	81.836	69.849	67.094	67.471	74.346	114.275	115.901	117.346
July	84.412	71.053	82.947	64.402	66.773	63.815	80.419	104.848	113.487	126.115
August	87.387	70.999	80.542	64.535	66.284	62.374	82.183	101.451	127.430	134.960
September	84.722	71.065	77.587	63.408	65.716	64.844	85.607	116.120	138.439	134.215
October	82.312	72.413	73.392	62.039	66.680	63.464	88.253	138.048	131.659	130.182
November	81.216	72.968	69.581	65.650	66.294	62.855	108.528	152.320	118.109	119.762
December	80.293	74.230	70.805	63.538	68.025	63.630	133.339	161.270	109.216	115.611

(1 MW US Producer Delivered.

Source: Metals Week.

Prepared by: State of Arizona Joint Legislative Budget Committee Staff.

TABLE XXII
AVERAGE COPPER CASH PRODUCTION COSTS FOR THE UNITED STATES, 1983-1989 (1
(Cents Per Pound Of Copper)

PRODUCT COSTS	1983	1984	1985	1986	1987	1988	1989
Mine operating cost	22	20	23	23	19	18	17
Mill-Float operating cost (2	24	23	20	21	28	28	27
Mill-Leach operating cost	7	7					
Smelt/Refine/Transportation	26	24	23	19	14	17	18
Taxes (3	3	2	2	2	2	1	1
Total Cost	**82**	**76**	**68**	**65**	**63**	**64**	**63**
Byproduct Credits	(13)	(11)	(9)	(9)	(10)	(10)	(9)
Cash Cost (4	69	65	59	56	53	54	54
Recovery of Capital				11	5	7	6
TOTAL				**67**	**58**	**61**	60

(1 Includes 18 mines, most of which were producing from 1983 to 1989.

(2 Includes copper recovered by leaching in 1985 et.seq.

(3 Property, severance taxes, and royalties, if applicable.

(4 Includes all cash cost of production and credit for byproducts but excludes depreciation and profit. Costs are in actual dollars for each year shown.

Source: U.S. Bureau of Mines Mineral Yearbook, Volume 1 - Metals & Minerals

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ANTLER T17N R16W Sec 4	Standard Metals Corp.	Sulfide	5	1.95	With 4.13% Zn, 0.94% Pb, and 1.05 Ag oz/ton. Annual Report & Form 10-K, 1987. An additional 2.5 million tons reported in 1979 Annual Report.
ATLAS T11S R8E Sec 32	Asarco	Sulfide	5	0.64	Report on the BS&K Project, Pima Co., AZ" by Frank H. Buchella. Cutoff at 0.40% Cu.
		Acid Soluble	5	0.37	Cutoff at 0.20% Cu.
		Sulfide	19	0.66	Asarco property adjacent to Atlas.
		Acid Soluble	12	0.38	Asarco property adjacent to Atlas.
BAGDAD T14N R9W Sec 4	Cyprus Minerals Co.	Sulfide	774	0.41	With 0.022% Mo. (includes acid soluble) Form 10-K, 1990.
BUCKEYE EAST T3S R12E Sec 26	Asarco Inc.	Acid Soluble	22	0.65	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
CACTUS T1N R13E Sec 36	Cambior	Mixed	10	0.70	Cactus Prospect Report. Cutoff at 0.2% Cu.
CARLOTA T1N R13E Sec 36	Cambior	Acid Soluble	4	0.85	Reported 1979.
CASA GRANDE T6S R5E Sec 18	Asarco Freeport McMoran	Mixed	352	1.00	Getty Oil Co. Annual Report, 1980. With 0.01% Mo. Cutoff at 0.5% Cu.
CHILITO T4S R15E Sec 22	Asarco Inc.	Mixed	75	0.51	Chilito Mines Report. With 0.01% Mo, 0.04 oz Ag.
CHRISTMAS (OP)	Cyprus Minerals Co.	Sulfide	7	0.63	Inspiration Resources Form 10-K, 1983
CHRISTMAS (UG) T4S R16E Sec 30		Sulfide	20	1.82	(same as above)

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
COCHISE T23S R24E Secs 9 & 10	Phelps Dodge Corp.	Acid Soluble	210	0.40	Phelps Dodge Form 10K 1990
COPPER BASIN T13N R3W Sec 20	Phelps Dodge Corp.	Sulfide	70	0.53	With 0.021% Mo. Phelps Dodge Form 10K 1990
COPPER BUTTE T3S R13E Sec 30	Asarco Inc.	Acid Soluble	22	1.09	AZ Mining Assoc. "AZ Wilderness 1988" Report A-23 to Congress.
COPPER CREEK T8S R18E Sec 11	Magma Copper Co.	Sulfide	80	0.55	Old copper reserves data.
COPPER QUEEN T23S R24E Sec 9	Phelps Dodge Corp.	Mixed	1	5.50	Underground. Phelps Dodge Prospectus May 8, 1975.
DOS POBRES T5S R26E Sec 27	Phelps Dodge Corp.	Sulfide	232	0.89	Form 10-K, 1989, page 7.
DRAGOON T16S R22E Sec 25	Sullivan, James	Acid Soluble	25	0.50	0.5 to 0.6 acid soluble copper.
DYNAMITE T17S R13E Sec 30	Smith, Addison	Mixed	100	0.53	Unpublished estimate.
EMERALD ISLE T23N R18W Sec 22	Arimetco	Acid Soluble	2	0.72	Arimetco International, Inc. prospectus May 16, 1990

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ESPERANZA T18S R12E Sec 16	Cyprus Minerals Co.	Sulfide	48	0.27	With 0.034% Mo. Pennzoil Form 10-K, 1981.
FOUR METALS T23S R16E Sec 20	Dore Mining & Milling	Sulfide	3	0.82	Iso Mines Ltd. Annual Report, 1965.
GIBSON T1S R14E Sec 21	Lodestar Minerals Inc.	Acid Soluble	11	0.7	43 million tons at 0.40% Cu. Fletcher, J.B. et al report Aug. 1984.
HELVETIA T18S R15E Sec 36	Asarco Inc.	Sulfide Acid Soluble	337 22	0.54 0.55	With Sulfide - 0.088 oz/ton Ag, 0.0005 oz/ton Au.
I-10 T15S R23E Sec 31	Sullivan, James	Mixed	100	0.52	Unpublished estimate; with 0.02% Mo.
INSPIRATION AREA MINES T1N R14E Sec 25	Cyprus Minerals Co.	Acid Soluble	226	0.43	Cyprus Minerals Co. Form 10K, 1990 Acquired by Cyprus from Inspiration July 1, 1988.
IRON DOOR T13S R25E Sec 17	Unknown	Sulfide	63	0.38	Spike-E Hills Report. Cutoff at 0.20% Cu.
JOHNSON T15S R22E Sec 26	Arimetco	Sulfide Acid Soluble	9 26	0.60 0.29	Arimetco International Inc. prospectus May 16, 1990
KALAMAZOO T9S R16E Sec 9	Magma Copper Co.	Sulfide Sulfide	11 310	0.77 0.73	Form 10-K, 1987. (Additional mineralized deposit.)
KORN KOB T12S R17E Sec 14 *Continued*	Keystone Minerals Inc.	Acid Soluble	2 8	0.53 0.44	North Ore Body. South Ore Body. Holmes & Narrou report on Korn Kob,

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
					March 1974 section 5.
LAKESHORE T10S R4E Sec 25	Cyprus Minerals Co.	Sulfide (Porphyry)	41	0.71	Noranda Annual Report, 1984.
		Sulfide (Tactite)	9	1.35	Noranda Annual Report, 1984.
		Acid Soluble	16	0.77	Cyprus Minerals Form 10-K, 1989.
LONE STAR T6S R27E Sec 5	Phelps Dodge Corp.	Mixed	1000	0.41	Phelps Dodge Form 10-K, 1988.
MAGMA MINE T1S R12E Sec 35	Magma Copper Co.	Sulfide	5	5.52	Currently targeted reserves-1.7 million tons at 6.8% Cu with 5% cut-off. "Southwestern Pay Dirt," March,1990 pgs.4A-6A.
MAME T19S R25E Sec 20	Hope Mining & Milling Co.	Acid Soluble	1	1.10	Unpublished estimate.
MIAMI EAST T1N R15E Sec 19	Magma Copper Co.	Sulfide	6	3.14	Newmont Mining Annual Report, 1985.
		Sulfide	50	1.95	Minerals Yearbook 1973, VII Area Rpts USBM.
MIAMI TAILINGS T1N R15E Sec 30	Magma Copper Co.	Acid Soluble	30	0.34	Magma Form 10-K, 1990. Expect 54% recovery.
MINERAL BUTTE T4S R7E Sec 1	Berry, Julian	Mixed	15	0.42	Cutoff at 0.32% Cu. Bear Creek report.
MINERAL PARK T23N R17W Sec 19	Cyprus Minerals Co.	Sulfide	35	0.17	With .054% Mo. Pennzoil Form 10-K, 1981.
MISSION COMPLEX T16S R12E Sec 31	Asarco Inc.	Sulfide	600	0.68	With 0.13 oz/ton Ag. Asarco Annual Report, 1990.

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
MORENCI/METCALF T4S R29E Sec 16	Phelps Dodge 85% & Sumitomo 15%	Sulfide Sulfide Acid Soluble Mixed	665 150 960 150	0.79 0.72 0.35 0.70	Phelps Dodge Form 10K 1990 Western Copper Leaching reserves Coronado Deposit
NEW CORNELIA T12S R6W Sec 27	Phelps Dodge Corp.	Sulfide	160	0.56	Phelps Dodge Form 10-K, 1990.
ORACLE RIDGE T11S R16E Sec 16	Southern Atlantic Ventures Ltd.	Mixed	4	2.23	With 0.67 oz/ton Ag. Additional possible reserves of 4.4 million tons at 2.25% Cu E&MJ - June 1989, pg. 89
PEACH ELGIN T18S R15E Sec 15	Asarco Inc.	Sulfide Acid Soluble	14 10	0.78 0.75	West, Barbara J. report, January 1980.
PINTO VALLEY T1N R14E Sec 2	Magma Copper Co.	Sulfide Sulfide	355 317	0.39 0.39	Magma Form 10-K, 1990. *Outside of current mine plan.
POSTON BUTTE T4S R9E Sec 33	Conoco Inc.	Mixed	800	0.40	Copper Studies Inc., NYC, March 30, 1979. 500 million tons at 0.50% TCu from Conoco Annual Report, 1972.
RAY T3S R13E Sec 10	Asarco Inc.	Sulfide	626	0.95	Asarco Annual Report, 1990.
RED MOUNTAIN T22S R16E Sec 20	Kerr McGee Corp.	Sulfide	100	0.71	Tucson Daily Citizen, Sept. 23, 1970.
SACATON EAST (UG) T5S R5E Sec 26	Asarco Inc.	Sulfide	15	1.25	Asarco Inc. Form 10K, 1979.

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
SAN JUAN T5S R26E Sec 35	Claridge, Alf	Acid Soluble	16	0.52	Cutoff at 0.35% Cu or 20 million tons at lower grade with lower cutoff. Producers Minerals Corp. Rpt. June 1975.
SAN MANUEL T8S R16E Sec 34	Magma Copper Co.	Sulfide *Sulfide Acid Soluble	87 143 248	0.72 0.64 0.35	Magma form 10K, 1990. Cutoff at 0.50% Cu.. *Not in current mine plan. In Situ. Magma 10K 1990.
SAN MANUEL OPEN PIT T8S R16E Sec 35	Magma Copper Co.	Acid Soluble Acid Soluble Sulfide	38 9 1	0.42 0.14	Open Pit. Open Pit Marginal.
SANCHEZ T6S R27E Sec 25	Arizona Copper Co.	Acid Soluble	168	0.34	"Southwestern Pay Dirt", June 1989.
SANTA CRUZ T6S R4E Sec 13	Freeport McMoran & Asarco	Acid Soluble	800	0.43	50% joint venture with Asarco. USBM data 1985.
SHEEP MOUNTAIN PROPERTY T8N R2W Sec 13	Ungava Iron Ores, Ltd.	Sulfide	350	1.00	Copper content approx. Unpublished estimate.
SIERRITA T18S R12E Sec 7	Cyprus Minerals Co.	Sulfide	464	0.34	With .037% Mo. Cyprus Minerals Co. Form 10-K, 1990. Reserve estimates include Twin Buttes.
SILVER BELL T12S R8E Sec 11	Asarco Inc.	Sulfide	101	0.47	With 0.01 oz/ton Ag. Asarco Annual Report, 1989.

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
SQUAW PEAK T13N R5E Secs 29 & 30	Squaw Peak Copper May 16, 1990	Sulfide	20	0.36	Roe, Robert R., 1976 report.
STRAY ELEPHANT T4N R20W Sec 31,32	Heinrichs GEO Exploraton Co.	Acid Soluble	4	0.36	Potential of 13 million tons at 0.50% ASCO 1989 report by James Loughry.
STRONG & HARRIS T15S R22E Sec 13	Duram, A. et.al	Mixed	60	0.60	Unpublished estimate with 0.70 Zn.
TURQUOISE T19S R25E Sec 17	Santa Fe Mining	Acid Soluble	15	1.50	.05 oz/ton Au. Northern Miner, June 4, 1990.
TWIN BUTTES T18S R13E Sec 5	Cyprus Sierrita	Sulfide Acid Soluble			Cyprus Minerals Co., Form 10-K, 1989 39 million tons @ 1.00% 11 million tons @0.73% Reserves being depleted with Sierrita and remaining reserves included with Sierrita.
UNITED VERDE T16N R2E Sec 22	Phelps Dodge	Sulfide	21	0.52	USGS 1857 D.
VAN DYKE T1N R15E Sec 30	Arimetco	Acid Soluble	100	0.50	Mining Engineering, Dec. 1977.
VEKOL HILLS T10S R3E Sec 4	Tohono O'odham	Sulfide	105	0.56	With 0.014% Mo, 16 million tons acid soluble Cu. Final EIS, Vekol Hills Project, U.S. Dept. of Interior, Bureau of Indian Affairs, May 1988.

Continued

TABLE XXIII
COPPER RESERVE BASE IN ARIZONA (1

DEPOSIT	COMPANY	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
VENTURA T23S R15E Sec 1	Cyprus Minerals Co.	Sulfide	6	0.26	Iso Mines Ltd. Annual Report, 1965. With 0.28% MoS (6 million additional tons possible)
WHITE MESA T38N R9E Sec 29	Navajo Tribe	Acid Soluble	2	0.75	Mayo, E.B., 1955 report.
ZONIA T11N R4W Sec 12	Zonia Co.	Acid Soluble	35	0.31	Lundin, Richard J. et.al. Feb. 1985 report.

TOTAL COPPER RESERVE BASE IN ARIZONA

Sulfide	6.2 Billion Tons at 0.64 Cu
Acid Soluble	3.0 Billion tons at 0.41 Cu
Mixed	2.7 Billion tons at 0.52 Cu
TOTAL	**11.9 Billion tons at 0.55 or 65 million tons of copper**

(1 Reserve Base - That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).

"Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3.

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Durham, A. et al ..... Strong & Harris
Freeport McMoran/Asarco .. Casa Grande
Freeport McMoran/Asarco .... Santa Cruz
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Tohono O'odham Tribe ..... Vekol Hills
Unknown ..... Iron Door
Zonia Co. ..... Zonia

TABLE XXIV

ARIZONA AND U.S. COPPER MINE PRODUCTION IN SHORT TONS OF Cu, 1874-1990

Period	AZ Production	Cumulative AZ	U.S. Production	Cumulative U.S.	AZ % of US Prod. Ann'l	AZ % of US Prod. Cum
1874-1971*		24,889,171		60,365,183		41.2
1972	847,929	25,737,100	1,664,840	62,030,023	50.9	41.5
1973	867,506	26,604,606	1,717,940	63,747,963	50.5	41.7
1974	804,904	27,409,510	1,597,002	65,344,965	50.4	41.9
1975	751,489	28,160,999	1,413,366	66,758,331	53.2	42.2
1976	956,215	29,117,214	1,605,586	68,363,917	60.0	42.6
1977	852,620	29,969,834	1,503,964	69,867,887	56.7	42.9
1978	908,835	30,878,669	1,496,482	71,364,363	60.7	43.3
1979	957,251	31,835,920	1,591,200	72,955,563	60.2	43.6
1980	760,926	32,596,846	1,301,900	74,257,463	58.4	43.9
1981	1,071,949	33,668,795	1,695,500	75,952,963	63.2	44.3
1982	848,750	34,517,545	1,264,322	77,217,285	67.1	44.7
1983	747,604	35,265,149	1,144,306	78,361,591	65.3	45.0
1984	822,815	36,087,964	1,215,400	79,576,991	67.7	45.3
1985	878,044	36,966,008	1,218,900	80,795,891	72.0	45.8
1986	878,926	37,844,934	1,180,564	81,976,455	74.4	46.2
1987	862,034	38,706,968	1,384,394	83,360,849	62.3	46.4
1988	942,556	39,649,524	1,584,115	84,944,964	59.5	46.7
1989	1,004,891	40,654,415	1,651,501	86,596,465	60.8	46.9
1990	1,087,287	41,741,702	1,738,952	88,335,417	62.5	47.3

** For Cumulative Breakdown 1874-1911 and Annual Production 1912-1971, see "The Copper Industry" by Ken Phillips, published Feb. 1973 by ADMMR.*

(1 Source: "Mineral Yearbook - Area Reports: Domestic," U.S. Bureau of Mines and Table I this report.

THE ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

The objective of the Department is to promote the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence data base and disseminating information through publications, personal contacts and seminars.

The Department's mining engineers and geologists assist mining and exploration companies, prospectors and others interested in Arizona's minerals with mineral processing, mineral land acquisition, exploration, mine development, financing, government regulations and marketing.

The Department is a service agency and does not regulate, tax, or require any type of registration. The agency provides assistance that is tailored to meet the differing needs of the public. The following is a partial list of services which the Department offers:

- Maintain a site specific data base of unpublished reports and maps which includes 5,000 mine files and indexes of 10,000 computerized Arizona
- Maintain an information bank and library of mineral and mining information including a mine map library (hard copy and microfilm), government publications, periodicals, and unpublished master and doctorate theses.
- Gather and disseminate information on commodities and markets.
- Suggest target areas for possible exploration activity.
- Suggest prospects and individual properties for study and acquisition.
- Assist individuals and companies in their dealings with State regulatory agencies to facilitate their mining and exploration activity.
- Produce publications in the form of mineral reports, annual directories,technical reports, annual mineral industry surveys and information circulars. These include Laws and Regulations Governing Mineral Rights in Arizona, Directory of Active Mines in Arizona, Manual for Determination of Status and Ownership of Arizona Mineral and Water Rights, and others. A current listing of the Department publications is available upon request.